THE INDUSTRIAL-ARTS MAGAZINE

Volume XIX MAY, 1930 Number 5

Specifying Equipment and Supplies for School Shops

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A Standardized List Should Be Agreed Upon

VERY little headway can be made in economical purchasing of equipment and supplies until standardized major-equipment lists, small-tool lists, and supply lists are agreed upon for each shop. This is the industrial teachers' job. New items should be added to the approval lists only after careful investigation of their possible continued use. It is a good thing to impress upon young workers that anyone can do a piece of work with everything to do it with, but it takes a real mechanic to do it with a few tools and materials.

Divisions of Equipment

The equipment, which comprises all of the interior fixtures and supplies necessary to carry on the work in the shops, is usually considered under three general headings, (1) major equipment, (2) small tools, and (3) supplies.

Major Equipment includes such articles as power-driven machine tools, special furniture and workbenches. These articles give service for a long period of years and are considered "capital-cost" items in the budgets of school administrators.

Small Tools includes the hand tools used in the shops. These articles are semipermanent and numerically constitute a much larger list than the items designated as *major equipment*.

Supplies is the term used to designate those items which are consumed in use; for example, sand paper, paint, glue, and nails.

In preparing estimates for a budget or in arranging standard lists for shop distribution it is essential to handle each one of these divisions in a different way, hence, each division will be discussed separately in this article.

The Manufacturer's Representative

Many manufacturers maintain one or more men on their staff who make it a special job to call on the "school trade." These men have nothing to sell. Their purpose in calling is to find out first hand what are the school-shop needs. They are willing to give information about their products and directions how to use it. They are capable of advising one how to get the best results.

Manufacturers spend a considerable amount of money advertising their merchandise through the medium of our professional magazines, and through contacts made with shop teachers, such as exhibits at conventions, advertising space in convention-program booklets, and so forth. It has been my good fortune to find these advertisers very good friends. Measuring them by our standards, I find they contribute materially to the welfare of our profession. They are highly professional. They are well-informed. They contribute liberally in the dispensing of valuable information. Teachers can well afford to keep in close touch with these representatives, because it is one way for the teacher to keep well informed and up-to-date.

The Problem of Determining "Similar and Equal"

The problem of determining "equals" is one of the most difficult jobs a purchasing agent has to confront. I may be considered overly optimistic when I say the problem is becoming easier. This is because of the better business code now practiced by most distributors. Most salesmen will point out with enthusiasm the superior merits of the tool they are selling, but they are willing to admit that their competitors are producing a tool in the same competitive field. And even the most biased of us must admit that there may be standard tools of standard uniform quality manufactured by several reputable concerns.

Writing Specifications for the Purchase of Equipment and Supplies

No greater help can be given the purchasing department of a school system than a carefully compiled list of specifications from which correct and safe bid sheets can be prepared.

A standardized list of equipment and supplies has been agreed upon for each type of shop in Detroit. The course of study is carefully analyzed by a committee of teachers and the necessary equipment and supplies to teach it are selected. There is a continual cross checking of the tool lists of the different shops in order to reduce the number of different items carried on our

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inventory sheets. The crosscut handsaw will illustrate the system of cross checking. Just one kind of crosscut handsaw is purchased for all purposes. It is admitted that a fine-tooth saw would have its advantages for some work, while a very coarse-tooth saw would be better for other work; the same could be said about the length of a saw. A few years ago there were five different kinds of crosscut handsaws listed in our inventory sheets, but we have found the very slight advantages of having a variety of sizes is overcome by the advantages of the distribution of just one size, namely a 22-in. panel saw, with 10 points to the inch.

We are using a Foley Automatic saw filer and it is a great advantage to have one standard size of teeth on all crosscut and ripping handsaws. This saves the time to change both the "set-up" of the machine and the file used. All the old saws have been recut on a Foley retoother to facilitate the work of filing which is done in a central shop.

It is the business of the shop teacher to keep the equipment and supply inventory reduced to the minimum number of articles. Nine kinds of hammers should not be specified where five kinds will serve the purpose. The machinist hammer used in the general metal shop can be used in the garage and in household mechanics shop with little inconvenience to anyone.

Specifications for the purchase of hand tools are difficult to write unless it is desired to standardize on a given tool then, of course, all that is necessary is to name the tool, give its trade number and the name of the company who manufactured it. This is the easiest way to purchase, but it has not been found the most satisfactory. If the tool happens to be an "open line" the local jobber will not complain. On the other hand, if it is a "closed line" all local jobbers except the one who carries the favored tool are just "out of luck." Most school systems do not use discriminatory specifications. An attempt is made to designate equals.

The vocational department in Detroit has tried to give a fair and equal opportunity to all companies to furnish equipment, irrespective of whether the equipment is carried as an "open line" or otherwise. This is done by giving a complete and accurate description of each item. For example: 1. Saw, hand – 22 inch – 7 point – rip – taper ground – skew back – rosewood handle – blade high polish. Atkins Trade Number; Disston Trade Number; Simonds Trade Number; or equal.

We give as many trade names as we are able to check and find similar and equal. Great care must be exercised in selecting these equals, but I have found the companies' own agents are quite familiar with their competitor's goods, therefore it is to their own benefit to agree among themselves. A great unfairness can creep in by this method of writing specifications if the trade names and numbers specified are not of the same "list price." Generally speaking, any variation or difference in price can be attributed directly to a difference in quality. In this day of standarized production methods, there can be little difference in actual costs among producers of small tools.

Incidently, it does not appear to be a good practice to encourage the adoption of some "newly designed" or "improved" tool to the exclusion of all others. It will be found that it is a better school policy to stick to the "tried and the true." It is time enough to "adopt" a tool when it is in general use.

In our school system the vocational department, in coöperation with the purchasing department, have built up a card catalog of nearly 700 separate items of small tools, appliances, and small machines used in shop instruction. Each article is accurately named, and carefully described; each card carries the trade names and numbers from as many companies as can be obtained which meet the requirements.

When a manufacturers' agent or representative calls at the office we check these cards with him to see if the articles he sells are listed on this card catalog. It is his privilege to see what trade numbers from his competitors lines are carried, and to confirm or object. This catalog is now about five years old. It has been subjected to the scrutiny of many salesmen. The objections from the salesmen who call on me regularly have been reduced to almost none.

Sometimes a representative will call to introduce a substitute trade number on some item. His company have made some improvement or alteration, and this salesman will bring along a sample. If the sample proves his point, the trade number is immediately changed on our card; the new number will be in turn scrutinized by other salesmen who call.

When it becomes necessary for our board to buy small tools, a bidding list is made up and sent to all firms who desire to quote. The business is awarded to the low bidder, provided his bid is according to the specifications. Bidders who desire to quote on items of different specifications than those given in our lists must furnish samples and descriptive matter. Most bidders have found that it is better to submit their samples and get their trade number on the card catalog before bidding lists have been sent out.

The Purchasing of Major Equipment

The purchasing of major equipment is of great importance, because when once bought it is "with us for a long time." Unlike small tools or supplies, if unsatisfactory, one can do better next time. A good machine-shop equipment ought to give service for twenty years. The equipping of a new shop may require any amount from a few hundred dollars to several thousand dollars. The funds for major equipment is made usually by a special appropriation.

Schools usually purchase equipment by what is known as "competitive bidding." This makes it imperative that the specifications be written very carefully if the bidders are to be able to submit proposals intelligently. In smaller school systems the advice and help of experts who are experienced will be needed. In larger school systems where the purchase of major equipment is a reoccurring job, their own previous experiences can be utilized.

The writer has found that the specifications must be written to perform two very definite functions: The first is to give the bidder an adequate description of what is wanted. The second is to have the specifications so written that the bidders will be required to submit a proposal that will fully describe what it is proposed to furnish. The first requirements is the school's duty to the bidder. The second requirement is the bidders duty to the school. The following specifications will illustrate this dual requirement.

Notice to Bidders

The following general conditions are to be observed in furnishing the machine tools and attachments attached hereto.

1. *Accessories and Fittings*

In addition to all accessories as hereinafter described, it is understood that any minor fittings or details as are usually furnished with this type of equipment shall be included even though no specific mention is made of same, so that the respective machines shall be complete in every respect and ready for operation.

2. *Guards*

All machinery hereinafter mentioned shall be provided with guards for all belts, pulleys, gears, or other moving parts as required by the State Factory Inspection Bureau and subject to approval.

All guards are to be substantially built; if wire mesh is used, it shall be neatly fitted into strong iron frames; sheet metal or cast-iron casings are preferred. The guards shall be constructed so that they may be easily removed for repair or adjustments on the machine; fastening devices such as hinges, catches, or other positive methods shall be used to hold guards in place.

3. *Motors and Electrical Controls*

a) All motors provided for the machines hereinafter described shall be for a.c., 3-phase, 60-cycle, 220-volts circuits, unless otherwise stated; however single-phase motors may be furnished in sizes under ½ h.p.

b) The motor shall be of sufficient size for each machine to operate under maximum load; the motor shall have a temperature rating of 40 degrees or cooler, which shall be indicated on the rating plate.

c) All motors shall be operated through a "General Electric Automatic Switch," 7006–D26. The purpose of this switch is to provide automatic undervoltage release and overload protection.

d) Each motor-driven machine shall be completely wired with all switches and controls fastened in place. Suitable provision shall be made for connecting to the power circuit.

4. *Cutting of Building*

The contractor shall not cut away any casing, timber, or into any walls, or other structural parts of a building or in any case allow the same to be done without the full knowledge and consent of the business manager of the board of education and shall be held responsible for any damages resulting from any violation of this clause.

5. *Delivery*

Machinery and all equipment is to be delivered on or before August 20, 1929, to the first or grade floor of the respective buildings. Otherwise bidders are requested to state the time required for delivery of all equipment at the several buildings.

Metal-Working Machinery for Tappan Intermediate

Item #1 – Engine Lathes – 11-in. Geared Head.
15 only required for the Tappan Intermediate School.

TYPE:	Geared head – Individual motor.
CAPACITY:	Eleven-inch swing, four-foot bed.
FRAME:	Cast iron, sturdy design, well finished in enamel.
MOTORS AND ELECTRICAL CONTROLS:	For detailed specifications see "general conditions," paragraph 3, attached.
GUARDS:	For detailed specifications see "general conditions," paragraph 2, attached.

GENERAL REQUIREMENTS:

1. The lathe is to be 8 speed, geared head with full quick-change gear box, no loose gears.
2. The drive shall be through silent chain or leather belt permitting of easy adjustment to take the slack.
3. There shall be a safety shearing pin.
4. The lathe shall pass an alignment test of .0005 inch.
5. Each lathe shall have a chip pan.
6. Special note: No steady or center rest is to be furnished.
7. The bidder will supply the following information:

Swings over bed.....	Size of Drive Pulley on Geared Head, Single Pulley Drive .....
Swings over carriage..	
Lengths of bed	
Front bearings.....	
Rear bearings	Lead screw diameter and thread per inch.....
Hole through spindle..	
Collet Capacity	
Takes between Centers	Headstock Base Length .....
Approximate weight crated (4-ft. bed).....	Tailstock Base Length .....
Size of Tool Holders..	Tailstock Set over..
Compound Rest Travels	Geared Head Speeds .....
Capacity of Steady Rest	Belt for single pulley drive.....
Thread Range	Speed of Drive Shaft .....
Carriage Bridge.....	
Spindle Nose.....	Geared Head Ratios .....
Motor – H.P.	
Speed of Motor	

ATTACHMENTS TO BE FURNISHED FOR EACH LATHE:

1. One universal three jaw, 4-inch chuck with one set of reversible jaws; the chuck is to be mounted and fitted for the spindle. This chuck to be similar and equal to a "Cashman."
2. One straight shank "Armstrong" tool holder with tool bit.
3. Two dog plates – one small, one large.
4. Two centers – both hardened.
5. Necessary wrenches.
6. One lathe dog – safety type – capacity 1 inch.

Unit Cost .....
Total Cost of 15 Lathes .....

Item #1A – One Set of Attachments for 11-in. Engine Lathes – Geared Head.

The following set of attachments are to be furnished to fit the lathes specified in Item #1:

1 only	Drawn-in attachment with one each – 3/16, ¼, 5/16, ⅜, 7/16, ½, 9/16, and ⅝ inch collets.....	Cost .....
2 only	Drill sleeve sockets to fit tailstock spindle	" .....
2 only	Boring tool holders – complete	" .....
2 only	Safety lathe dogs, malleable iron, ⅜ inch	" .....
2 only	Safety lathe dogs, malleable iron, ¾ inch	" .....
4 only	Safety lathe dogs, malleable iron, 1 inch	" .....
4 only	Safety lathe dogs, malleable iron, 1½ inch	" .....
1 only	Safety lathe dogs, malleable iron, 2 inches	" .....
1 only	Taper attachment.....	" .....
2 only	Tool holders, right hand "Armstrong"	" .....
2 only	Tool holders, left hand "Armstrong"	" .....
1 only	Follower rest	" .....
1 only	Center rest	" .....
1 only	Crotch center	" .....
1 only	Drill pad center	" .....
	Total Cost for Set of Attachments..	$ .....

Item #2 – Sensitive Drill – 14-in. Swing.
1 only required for Tappan Intermediate

TYPE:	Upright, belt driven with individual motor.
CAPACITY:	14-inch Swing.
FRAME:	Cast iron, sturdy design.
MOTORS AND ELECTRICAL CONTROLS:	For detailed specifications see "general conditions," paragraph 3, attached.
GUARDS:	For detailed specifications see "general conditions," paragraph 2, attached.

GENERAL REQUIREMENTS:

1. This drill press to have two tables; a square table to permit of tilting, the round table to be adjustable vertically.

2. Variation in speed shall be obtained through step-cone pulleys.
3. The spindle to have No. 2 Morse Taper Hole.
4. The bidder will supply the following information:

Height of Column .....
Total height over all .....
How high spindle up .....
Largest size drill .....
Vertical adjustment of head .....
Diameter of spindle .....
Hole in spindle .....Taper.....
Vertical Travel of spindle .....
Distance of spindle from square table.....
Apron on square table .....
Distance of spindle from round table.....

ATTACHMENTS TO BE FURNISHED FOR EACH DRILL: The following shall be furnished with the drill press:

1 only Crotch center
1 only Cup center
Belts, wrenches, and anything else required to operate the machine.

Total Cost $ .....

Item #3 – Universal Milling Machine.
2 only required.
1 only required for the Jackson Intermediate.
1 only required for the Tappan Intermediate.

TYPE: Universal, all geared head, driven by single pulley, individual motor, housed in frame.

CAPACITY: Equal or larger than a No. 1
Longitudinal feed to be about 22 inches
Transverse feed to be about 8 inches
Vertical feed to be about 18 inches

FRAME: To be designed for individual motor drive, providing complete housing for all gears, well finished in enamel.

MOTOR AND ELECTRICAL CONTROLS: For detailed specifications see "general conditions," paragraph 3, attached.

GUARDS: For detailed specifications see "general conditions," paragraph 2, attached.

GENERAL REQUIREMENTS:

1. Driven through constant-speed, single pulley.
2. To have adjustable spindle bearings and standardized spindle nose.
3. This machine shall be provided with an oiling system which will keep main running bearings adequately lubricated at all times.
4. All gears to be hardened steel.
5. Approximate size of table 40" x 9".
6. The bidder will furnish the following information in the space provided:

Table feed – Automatic .....
Cross feed – Automatic .....
Vertical adjustment .....
Working surface of table .....
Table swivels (right and left) .....
Table has T slots .....
Number of spindle speeds .....
Range of spindle speeds (r.p.m.) .....
Standardized taper in spindle .....
Spindle nose threaded .....
Diameter driving pulley .....
Speed driving pulley (r.p.m.) .....
Width of driving belt .....
H.P. of motor recommended .....
Speed of motor recommended .....
Number of feed changes .....
Range of feed (in per min.) .....
Index centers take in length .....
Three-jawed universal chuck .....
Vise jaws .....
Vise opens .....
Floor space .....
New weight (pounds) .....
Weight .....

ATTACHMENTS TO BE FURNISHED FOR EACH MILLING MACHINE: The following attachments are to be furnished for the machine:

1 only Universal spiral dividing head, with centers, 3 index plates, center rest and foot stock.
1 only Swivel vise
1 only Arbor 1" x 12" with two collars–1½"; two collars – 2"; two collars – 2½"
1 only Universal chuck, 3-jawed.
1 only Standardized spindle end adapter with No. 7 B.S. inside taper.
1 only Collet outside taper No. 7 B.S., inside taper No. 5 B.S.
All necessary wrenches and belts.

Cost of Each .....
Total Cost of 2 Machines .....

Item #4 – Milling-Machine Cutter, for Use on Machines Described in Item #3.
2 sets required
1 set for Jackson Intermediate School
1 set for Tappan Intermediate School
The following cutters are to be H.S. steel.

1 – Cutter for Woodruff Key Seat, R.H. #9 – ¾" x 3/16" ½" straight shank.
1 – Involute Gear Cutter #6 – 16P. – 1" hole on No. 3 B.S. Automatic.
1 – Involute Gear Cutter #5 – 15P. – 1" hole on No. 3 B.S. Automatic.
1 – Involute Gear Cutter #4 – 16P. – 1" hole on No. 3 B.S. Automatic.
1 – Involute Gear Cutter #4 – 12P. – 1" hole on No. 3 B.S. Automatic.
1 – Involute Gear Cutter #4 – 14P. – 1" hole on No. 3 B.S. Automatic.
1 – 45-degree Angular Cutter 2¾" x ½", 1" hole
1 – Side Milling Cutter 3" x ⅜", 1" hole
1 – " " " 4" x ½", 1" hole
1 – " " " 6" x ½", 1" hole
2 – Slab Millers 2½" x 2½", 1" hole (Milling Cutter)
1 – Slitting Saw 3" x 1/16", 1" hole
1 – " " 3" x 1/8", 1" hole
1 – " " 5" x 1/8", 1" hole
1 – Spiral End Mill, R.H. 5/16" diameter with B.S. Taper #5
1 – " " " " 1/2" " " " " " "
1 – " " " " 5/8" " " " " " "
1 – " " " " 1¼" " " " " " #7

Cost of each set .....
Total cost of two sets of attachments .....

Item #5 – Motor Head Speed Lathes 12" x 4' Bed.
15 only – Required for the Jackson Intermediate

TYPE: Motor Head Speed Lathes.

CAPACITY: 12" Swing – 4' bed – to turn 24" between centers.

FRAME: Cast iron, sturdy construction, heavy leg, well finished, and enameled.

MOTOR AND ELECTRICAL CONTROLS: For detailed specifications see "general conditions" attached.
The controller shall be of the inclosed 4-speed type, and so constructed that it is impossible to start the motor in any but "low speed." The control box, switches, etc., shall be so constructed and located that no grease, oil or dirt can get into the electrical controls. The control shall be by handwheel or lever.

GUARDS: For detailed specifications see "general conditions," paragraph 2, attached.

GENERAL REQUIREMENTS:

1. The bearings shall be ball bearing of highest quality and standard make.
2. Speed range from 550 to 3400 r.p.m.
3. A system of lubrication shall be provided so that it will be impossible to flood the motor with oil.

ATTACHMENTS TO BE FURNISHED FOR EACH LATHE: The following shall be furnished for each lathe:

1 only	Center or drift rod.
1 only	Combination handwheel and faceplate.
1 only	Cone center ¾"
1 only	Cup center ⅝"
1 only	Spur center
1 only	Screw chuck, 2½" diameter, with center screw, 2 side holes counter sunk for screws
1 only	Faceplate, front, 4" diameter.
1 only	Hand tool rest 4" to 6" long.
1 only	Hand tool rest 12" long.
1 only	Rest holder complete, with socket for tools.
	Unit Cost .....
	Total cost for 15 Lathes .....

These types of specifications should be used only if it is intended to give equal consideration to all makes of machines which meet the general requirements. If it is the intention to buy "West end" lathes then it is, to put it mildly, discourteous to cause the makers of "North end" lathes and others to go to the trouble of preparing a proposal, leading them to believe their machines are being considered. Why not send an order to the "West end" company in the first place? Why bother to go through the subterfuge of a competitive bid?

An analysis of the specifications here illustrated will show that the general requirements are set forth, but no mention is made of any particular firm's name.

Following the general requirements, provision is made for the bidder to give certain necessary information. This information is so arranged that the checking of the proposals submitted by several firms can be tabulated for comparison with accuracy and speed.

The successful bidders are awarded the contract. There may be some advantage in awarding the total to one firm, but it seems to be the policy in the writers school system to make the awards item by item. I believe it is the best way.

The Detroit Board of Education require a certified check from each bidder to accompany an important proposal to furnish equipment in order to guarantee the completion of their proposal if they are awarded the contract. The contract is secured by a bond to insure a prompt delivery. It may be of interest to know that these penalties are rigidly enforced upon firms who make tardy deliveries.

The Purchasing of Supplies

The purchasing of supplies is one of the most perplexing things shop people have to confront. Generally speaking there are three methods: (1) The board furnishes everything without charge to the pupil; (2) the board purchases the supplies and arranges for their retail sale to the pupils at cost; (3) the pupils purchase them from retail dealers.

However, Detroit does not adhere strictly to any one of the methods outlined, but uses a combination of all of them to meet special situations. The major part of all supplies used in the Detroit schools are furnished without cost to the pupils. There is a centrally operated supply room, and deliveries are made once each month to each of the 250 school buildings. A study extending over several years has made it possible to set up a distribution of supplies based on the number of clock hours a student works in a given shop. Even with the care that has been given to this study, the distribution sheets can be considered little more than a guide or suggestion to the teachers. All teachers are encouraged to initiate projects, and this variation in work from school to school makes a hard-and-fast standard impracticable.

We have a card catalog covering some 350 items furnished as supplies. Each card carries the complete buying description. The purchases are carried out in the same manner as the purchase of small tools.

Human Relationships in Supervision

*Thomas A. Hippaka**

THE ability to promote and to retain pleasant relationships with others, and among others, constitutes one of the most important assets of the supervisor. While it is often a most difficult task to keep personal relationships upon such a plane, the job is, nevertheless, worthy of the greatest possible effort. A department in which friendly feeling and good working relationships exist between the workers as well as with people outside, is generally one where the morale is high, and where the efficiency which results from coöperative effort, quite generally prevails.

To develop the best working relationships among members of the department, involves considerable forethought and tact on the part of a supervisor. Teachers must be permitted to participate in the affairs of the department if real success is to be achieved. This participation on the part of teachers means that an outlet has been provided for their initiative and individuality. Providing such an opportunity, increases the interest which teachers have in their work, and thus insures more satisfactory results. Leadership does not necessarily require the employment of a dictatorial attack. "We" and not "I" should be the pronoun commonly used. But the supervisor should not merely be a good fellow who is adept at hand shaking, but who drops no constructive criticism for fear that the feelings of an instructor may be injured. Ability to give constructive criticism without arousing antagonism should be developed. Care also should be taken not to give unwarranted praise, because this tends to make the supervisor less respected by the teacher.

Every supervisor has certain relationships with others for which he is directly or indirectly responsible. His relationships are of very immediate concern with some, while infrequently he plays the rôle of a promo-

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ter of good feeling among others. The skillful supervisor will employ preventative methods in every possible instance rather than permit embarrassing situations to arise and then attempt to remedy them. When a seemingly unavoidable strained condition has arisen, it then becomes the supervisor's duty to officiate fairly in the matter. His task is to get the facts and to base his final decision upon them. Among the direct relationships enjoyed by the supervisor are the following:

1. The supervisor and the superintendent.
2. The supervisor and the principal.
3. The supervisor and other supervisors.
4. The supervisor and his teachers.
5. The supervisor and the pupil.
6. The supervisor and the parent.
7. The supervisor and the community.
8. The supervisor and the board members.
9. The supervisor and teachers in other departments.
10. Generalities.

Other relationships for which the supervisor is indirectly responsible may be listed as follows:

1. The teacher and the superintendent.
2. The teacher and the board member.
3. The teacher and the principal.
4. The teacher and supervisors in other departments.
5. The teacher and teachers in other departments.
6. The teacher and pupil.
7. The teacher and the parent.
8. The teacher and the community.

Desirable human relationships are often a matter of understanding ones duties especially as they relate to the other fellow's job, coupled with consideration and respect for fellow coworkers. It is around this central thought that a number of ideas are submitted with a hope that they may prove helpful.

I. *The Supervisor and the Superintendent*

1. A pronounced spirit of loyalty and coöperation should exist between these officials.

2. The supervisor must understand that he is, or should be, an expert adviser of the superintendent, and that he is a member of the latter's official family.

3. Both should understand each other clearly.

4. Each should keep the other informed as to the plans and policies of immediate concern.

5. The spirit of friendliness should be so pronounced that any matter can be discussed with perfect frankness resulting preferably in agreement. However, where disagreement results it should not produce hard feelings.

6. The supervisor should never "go over the head" of the superintendent to members of the board of education. The supervisor must realize that he is a "line officer," and as such, should see that matters proceed through proper channels. Such a procedure constitutes desirable professional decency.

7. The supervisor acts as a "breakwater" between the sources of difficulty in his department and the superintendent. Details which rightfully belong to the former should seldom burden the latter.

8. After the supervisor has presented his side of any situation clearly and without bias, he should be willing to accept the final decision in the matter without further question and do everything in his power to carry out the policy finally adopted.

9. Where other members of the staff as well as the general public speak loosely and without authentic information upon school matters and about school administration, the supervisor should never permit an opportunity to pass without giving the proper information relative to conditions as they actually exist.

II. *The Supervisor and the Principal*

1. The supervisor should realize that the principal is responsible for his school and as such has full control over it.

2. Details pertaining to a particular school should be first taken up with the principal of that school. A supervisor should not "go over the head" of the principal to the superintendent, unless it is absolutely necessary, and it should be done only after exhausting all other means of settlement with the principal.

3. The supervisor advises the principal and makes recommendations in matters pertaining to the department. The principal may or may not heed such advice, but if he does not, it is he who is responsible for the outcome when things go wrong. If, on the other hand, the supervisor misinforms the principal or uses poor judgment in his recommendations, the supervisor is solely to blame for errors that arise due to the principal's acceptance of the advice.

4. The supervisor should at all times maintain a spirit of loyalty, understanding, friendship, and coöperation toward the principals of the schools under his supervision.

5. The supervisor should familiarize himself with the plans and policies of the principal as they relate to the supervisor's department.

6. Arguments are to be avoided. Nevertheless, it should be possible to have discussions, exchange of ideas and friendly disagreement without any ill effects.

7. The supervisor should first present innovations or proposed additional activities to the principal of the school concerned, and put them into effect only after they have been agreed to by the principal.

8. The supervisor should keep the principal informed at all times relative to what is taking place in the department.

9. The supervisor's activities should be so beneficial to the general welfare of the school, and so constructive in nature, that no question remains in the mind of the principal as to the worth of his services.

10. When visiting a school the supervisor should work through the principal. His first duty is to call on the head of the school and so plan his activities as not to conflict with anything that the principal is doing.

III. *The Supervisor and Other Supervisors*

1. Supervisors should have a sympathetic understanding of the other fellow's job.

2. Coöperation should be the keynote. Where concerted effort seems impossible due to the lack of time, space, equipment or help, such explanations should be carefully made.

3. Where one supervisor is responsible for all programs of special departments, a knowledge of the common difficulties arising in the system as a whole should be clearly defined. Everyone concerned may then understand more fully the necessity for certain program arrangements.

4. Petty jealousies should never exist. A spirit of perfect frankness should prevail. Where a fellow supervisor is to be quite seriously affected by a certain move on the part of another, he should be consulted before action is taken. Previous explanation clears the atmosphere and prevents suspicion and hard feeling.

IV. *The Supervisor and His Teachers*

1. The supervisor's attitude toward the teacher should be one of sympathetic understanding.

2. The supervisor should be a "big brother" or "big sister" to his teachers.

3. The supervisor should be a good listener.

4. The supervisor should play the rôle of a kindly counselor to teachers.

5. "Vision" should be kept in supervision.

6. The supervisor's relationship with teachers should be such as not to destroy initiative and resourcefulness in the latter. The domineering attitude should never prevail.

7. Whenever possible, policies should be worked out with the aid of the teachers. Opportunity is thereby provided for an expression of opinion.

8. Policies established by the board of education and the superintendent should be carefully and tactfully presented to

teachers, making clear the reasons for the adoption of such policies.

9. The reasons for certain program arrangements which at times seem undesirable should be carefully explained instead of the supervisor assuming the "take-what-you-get" attitude.

10. A word of praise and encouragement should be dropped at least occasionally. Sad, indeed, is the situation where a supervisor cannot find something in the efforts of the teacher that deserves commendation.

11. Where a teacher does a very definite piece of individual work he should receive full credit for it. Why should the supervisor's name be written on it most conspicuously when he has expended little or no effort upon the task.

12. A teacher should never be criticised before his pupils. Criticism constructive in nature should be offered in a private conference.

13. Supervisors hear good as well as poor reports from parents and others, and are prone to pass on only the unsatisfactory ones. Teachers are human and should receive the benefit of the good reports as well.

14. When passing judgment upon the teacher's efforts, the supervising officer should have the facts. Results of his visits should display clean-cut ability to analyze. He shall have done more than to merely greet the teacher and graciously excuse himself. Constructive criticisms should be based solely upon the findings.

15. The teacher expects help and is naturally disappointed in a supervisor who fails to give it.

16. The supervisor must expect to find some faults in teachers. If they were perfect, many supervisors would be without jobs.

17. Where the supervisor has the facts, he should hold firmly to his conclusions and recommendations.

18. Give the teacher credit for his efforts. He or she thrives on it and needs it as a further incentive to good work.

19. "We" is a more appropriate term for the supervisor to use than "I."

20. If a teacher is a fighter for the improvement of his own work and conditions in this shop or classroom, he should not be considered selfish. He is wide awake.

21. A supervisor should seldom interrupt a teacher when the latter is making a demonstration or a presentation. If such an interruption is made it should be done tactfully and with the permission of the instructor.

22. Entering or leaving the room without a word to anyone should be avoided by the supervisor whenever possible. It is not always possible to speak to the teacher. However, a smile or a nod of recognition will go a long way.

23. The supervisor should be acquainted with the teacher's home conditions, his social interests, general welfare and health. Such acquaintance tends toward more intelligent understanding.

24. The supervisor should know what the teacher's objectives are for a lesson that is being observed and what the instructor is attempting to accomplish. The supervisor's comments and criticisms will then mean more and secure for him greater respect on the part of the teacher.

25. Supervisor and teacher should not disagree before pupils.

26. Under no conditions should the supervisor relate to other teachers matters given to him in confidence by another instructor.

27. The supervisor should not make it a practice to relate the weaknesses and peculiarities of a certain teacher to another.

28. Where teachers are prone to gather for the purpose of gossip or "mud slinging," instead of entering into such discussions, the supervisor should discourage them by doing his very best to divert the thinking into more useful and respectable channels. Standing aloof from the teachers will not accomplish this.

V. *The Supervisor and the Pupil*

1. The supervisor should so conduct himself as to be a friend and helper to the students. He should be one of them.

2. He should be careful not to impress pupils as being a "hard-boiled inspector."

3. He should remember that his attitude toward the teacher is reflected in the pupils.

4. He should become a member of the class just as soon as he enters the room. In this he should be very unassuming.

5. Where a student has performed a good piece of work the supervisor should tell him so. Favorable comment judiciously dropped, spurs the pupil on to even greater effort and accomplishment.

6. The supervisor should have a very definite estimate of the pupils in the class which he is observing. His attitude toward them will be better and his estimate of the teacher will be more fair.

7. Often pupils will come to the supervisor for help. His ideas and methods should coincide with those of the teacher.

VI. *The Supervisor and the Parent*

1. The supervisor should accept every opportunity to talk to groups of parents and to explain objectives, methods and accomplishments in his particular field.

2. He should meet parents as individuals in a social way and create the very best of feeling and understanding.

3. Parents may also be enlightened through the pupils.

4. Suggestion and constructive criticism should be welcomed from parents. The supervisor should always be on the alert to squelch unjust criticism and prolonged misunderstanding.

5. Where difficulty has arisen between pupil and teacher and the parent comes to the supervisor, the latter should be able to handle the situation in a tactful manner terminating in satisfaction and better understanding.

VII. *The Supervisor and the Community*

1. The supervisor should be a vital and living part of the community.

2. If possible he should be a member of some very active civic organization.

3. He should be an active church member.

4. The work of the young in the community should receive his loyal backing.

5. Concerted community effort should receive his attention and support.

VIII. *The Supervisor and the Board Member*

1. The supervisor should become reasonably well acquainted with board members.

2. Meeting board members even in a social way affords supervisors an opportunity to enlighten them upon noteworthy things that are being attempted without becoming a bore or a pest.

3. The supervisor should be sufficiently professional spirited not to take matters to a board member that should rightfully transpire between supervisor and superintendent.

4. When asked to appear before the board of education by the superintendent, the supervisor should have his subject well in hand and be able to dispose of it in a commendable manner.

5. When any information is requested by a board member, the supervisor should be in a position to provide it promptly.

IX. *The Supervisor and Teachers in Other Departments*

1. The supervisor should render such help and council as these teachers need on matters pertaining to the former's specialty, particularly when the latter request it.

2. Each should coöperate with the other in every respect, particularly in doing what is best for the child.

3. An occasional exchange of ideas promotes more intelligent understanding.

4. An occasional visit on the part of the academic teacher to her boys or girls when the teacher of special subjects has them, tends toward more effective coöperation. Possibly the supervisor can help to encourage such visitations.

X. *Generalities*

1. Avoid making promises which involve large expenditures of time and coöperative effort without first consulting your staff.

2. It is well to remember that promises make friends, but failure to fulfill such promises turns them into enemies.

3. "We will do the best that we possibly can," constitutes a better proposition than to make a rash promise and for some unforeseen reason fail in the end.

4. Be cautious, pleasant, patient, sympathetic, and accommodating with everyone with whom you have dealings.

Indirectly the supervisor can do much to promote and sustain desirable relationships between his teachers and other members of the city staff, parents, pupils, and the community. His contacts as well as his training enable him to point out at least some of the pitfalls to be evaded when establishing desirable human relationships. The supervisor should be careful to explain adequately and clearly the reasons for the adoption of certain policies by the board of education. He must be equally anxious that teachers understand the justification and expediency of certain rulings and interpretations rendered by the superintendent of schools. Working in close harmony with the principal, the supervisor is able to clear in the minds of teachers the plans of the former. Likewise, the same service may be rendered in connection with supervisors and teachers in various other departments, at least to a certain extent. In the case of the pupil, the supervisor does everything in his or her power to aid the teacher to understand the child better. Where difficulties arise between the teacher and the pupil, the supervisor should arbitrate fairly and give the instructor worth-while suggestions based upon the facts in the case. The supervisor can do much toward the promotion of desirable relationships between pupil and teacher with the attitude that he assumes during visitations. Meetings of the parent-teacher association, offer the supervisor a splendid opportunity to promote friendly feeling and understanding between teachers and parents. The community in general may be reached and enlightened through the local newspapers. Truly, the supervisor can go a long way toward being his "brother's keeper," thereby promoting greater harmony and coöperation.

Pewter in the Art-Metal Shop

*Emerson Wm. Manzer**

COLONIAL AMERICA, with its historical settings, its national characters, its thrilling stories, is revered by all who have had the opportunity of studying our early American history. The heritage that is ours, by virtue of the efforts made by these early settlers amid untold hardships, is rapidly becoming more valuable, not only because of our love for those great epoch-making characters whom we still enjoy reading about, but more so through a more natural and realistic bond that is being built up by our constant use of articles that bespeak that early Colonial life. We see

*Supervisor of Manual Arts, Bronxville, N. Y.

WORK DONE BY JUNIOR-HIGH-SCHOOL PUPILS, BRONXVILLE SCHOOLS, BRONXVILLE, NEW YORK

WORK DONE BY ADULTS IN THE EVENING CLASSES IN PEWTER CRAFT, BRONXVILLE, NEW YORK

this exemplified in the beautiful white colonial homes that breathe an air of yesteryear, we find it in the treasures of antique collectors, and we discover it no less in the marvelous pieces of metal ware that were wrought and designed by the hands of those early craftsmen.

To foster this heritage, we find another valuable source in the large museums of the country. It is here that we can see, and sometimes touch, the artistic work of such master craftsmen as Duncan Phyfe, William Savery, John Goddard, Andrew Gautier, and other equally famous cabinetmakers of the early periods of America. Original pieces made by that patriot-silversmith, Paul Revere, one of the most versatile characters of the Colonial period, and by hundreds of other silver craftsmen who practiced industrial arts before the nineteenth century, may be seen reposing peacefully next to the work of contemporary craftsmen. These silent sentinels bespeak the life of the colonies and are doing much toward the revival of interest in furniture and metal ware that is designed after the early patterns.

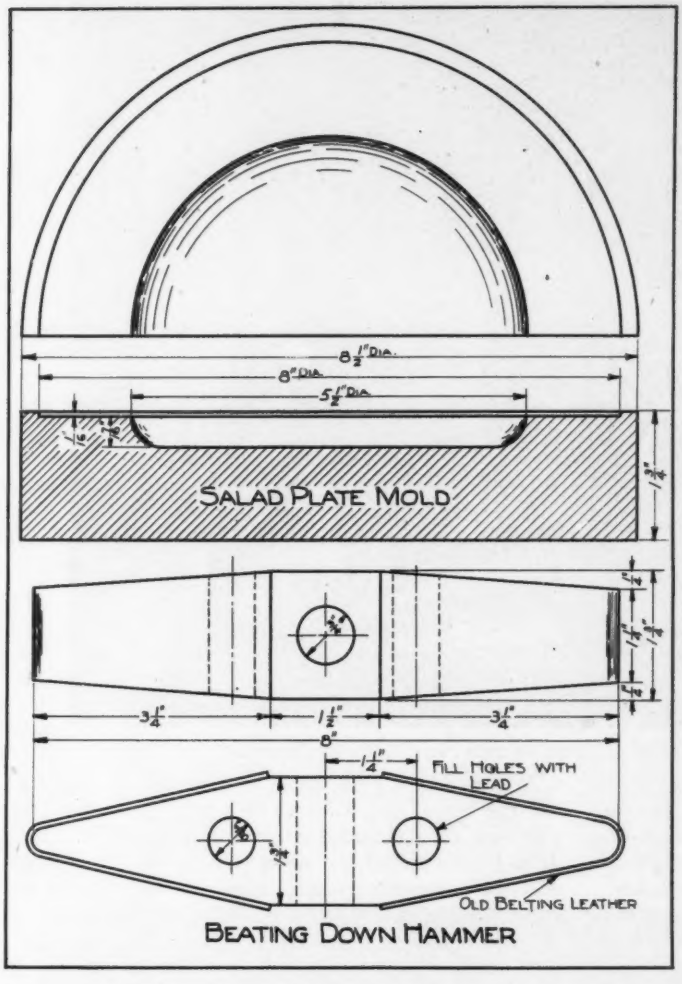
Replicas of antique furniture and metal ware are now being shown in the leading stores of all large cities. In several silver factories recently visited by the writer, there is a decided emphasis on articles of pewter. What significance does this trend have? It simply means that the public pulse has been felt, a careful diagnosis made, and the furniture and silver manufacturers are meeting the demand with merchandise that is being accepted in the modern home.

Pewter ware has captivated those who can afford whole services of the beautiful somber gray metal. Its popularity has placed it ahead of silver, and today the bride's gifts consists chiefly of pewter. This ware owes some of its popularity to the manner in which it blends with almost any kind of interior decoration.

We have kept pace with the demands for furniture for the home, and it seems that with little effort we can meet the demands for metal ware in pewter. Many schools have already added pewter to their list of metal and the astonishing results have crowded out the old traditional metals of the art-metal shop. This result is attributed mainly to the fact that pewter does not have to be annealed, and that it can be changed into different shapes by the hands of junior-high-school students with little effort. In the metal-craft shop of the Bronxville High School one may find, at different times, three classes of junior-high-school boys and girls, and four adult classes who are making lovely articles of this very pliable metal. Articles such as salad plates, ash trays, chop plates, 18-in. trays, sugar and creamers, bowls of various sizes, large water pitchers, book ends, candle sconces, napkin rings, desk sets, and numerous other items of original design, may here be seen in process of being made.

Very little extra equipment is necessary for the introduction of pewter metal craft in any well-organized and equipped school shop. Most of the equipment is in the form of special molds for shaping the metal. Special hammers may be purchased for beating down the metal in the molds or they may be made from maple or birch wood and the ends covered with pieces of old leather belting. This type of hammer has proved to be the most satisfactory for making all forms of plates and also for small bowls. The accompanying illustrations give the necessary dimensions for making such a hammer, and also the molds required for beating down pewter plates.

A word or two of explanation about the mold will perhaps clear up several questions that might arise after viewing the drawing. The drawing shows a mold designed for making 8-in. salad plates. The outside



BEATING DOWN HAMMER

diameter is 8½ in., thus making provision for a ¼-in. rim on the outer edge of the mold. This is deemed necessary for two reasons, namely, that the pewter disk will fit into the mold and will not slip about when the first work is being done. The other reason is this: Oftentimes the wood used for the mold will shrink in drying, and when this occurs one will find that the 8-in. disk will not fit properly. It is then necessary to fasten the mold to the lathe faceplate again and turn the opening to the proper dimensions. It is therefore a good plan to mark the faceplate and the mold in such a way, that whenever the form has to be re-turned, the faceplate will again be attached to it in the original position.

To start a plate it is necessary to draw a light pencil line on the surface of the disk at the position where the edge of the well of the plate is to be located. It is here, and here only, that the beating down is done. It is not necessary to hammer the center or the well of the plate, as this comes down naturally with the metal as it is stretched with each blow of the hammer. Hard hammer strokes will not make a good plate. It is better to make more light strokes and have them overlap than to try to hasten the making of the plate too much. After the well has been formed and the metal is on its way into the depression, the force of the hammer blow may be increased a little. Too much hammering stretches more metal than the well depression can take, consequently the plate will start to rise out of the mold.

There are many good books on the market that will supplement the original fund of information possessed by the instructor. Most of them, however, are written for the collector of pewter ware, but one can obtain many useful ideas from them and thus aid in the creation of original pieces of work. The most practical book for those who desire to introduce this phase of metal work or for those who wish to make a few pewter articles for personal use, is *Pewter Design and Construction*,[1] written by Professor William Varnum, of the Department of Applied Arts, University of Wisconsin. This book is full of constructive ideas on articles of pewter ware, while the many illustrations and graphic representations of methods are such that most anyone with some technical background can soon learn to make many useful and practical articles of that ever popular metal — pewter.

[1]Published by The Bruce Publishing Company, Milwaukee, Wis.

How to Order Paint and Varnish Brushes

*Claude H. Ewing**

A WORKMAN is frequently judged by the tools and equipment which he uses. If we see a man, decked in white overalls, jacket and cap, perched on a scaffold, painting a house, we immediately assume he is a competent painter. If on closer observation we see him using a small brush on a large surface, or a large stucco on French sash, the question arises in our mind as to the extent of his trade knowledge and of his real standing as a mechanic.

The same thing is true in a school shop. Visitors that know good equipment, judge the teacher and his shop by its furnishing. The proper brush is as necessary as the proper bit, or saw, or any other tool. To secure such a brush, it is necessary to write the specifications clearly. With this in mind the following specifications are presented.

You will note that the order is written for a fraction of a dozen, as the brushes are packed by the dozen or fraction of a dozen. The brushes specified are of a kind and size most usually used, and are standard as to size and type.

*Washburn Continuation and Trade School, Chicago, Illinois.

The following items must be specified for each brush ordered:

1. The kind of brush; that is, varnish, paint, and so on.
2. The size in inches.
3. The binding, leather or metal. If metal the kind.
4. The bristles or hair, and the length. This is called the "Stock."
5. How the bristles are to be set into the binding.
6. The amount of Stock, which will be stated "Full," "Three Row," "Triple," or "Quadruple."

For Outside Painting.

Each painter usually has three brushes, which should be ordered as follows:

1/12 dozen leather-bound Stucco paint brush, No. 40, 4½ in. wide. Length of stock clear, 5½ in. Bristles are to be pure black Chinese, drawn all the way through the binding. They should be vulcanized in rubber, and set in three rows.

1/12 dozen leather-bound Stucco paint brush, No. 25, 3 in. wide. Length of stock clear, 4 in. Bristles are to be pure black Chinese, drawn all the way through the binding. They should be vulcanized in rubber, and set in three rows.

1/12 dozen cutter or sash tool with a long handle, metal bound, 2 in. wide. Length of stock clear 2⅜ in. Bristles are to be pure black Chinese, vulcanized in rubber, full stock.

For Wall Painting

Painters usually have one of the following:

1/12 dozen metal-bound wall brush, 4½ in. wide. Length of stock clear, 5 in. Bristles to be pure white Russian, vulcanized in rubber, full stock.

1/12 dozen Dutch wall brush. Size of block 1¾ in. by 4½ in. Length of stock clear 5⅛ in. Bristles to be pure gray Russian, set in a hard-rubber block with rubber, and bound by a nickeled steel ferrule. The handle to be of hard wood screwed to the block.

For Painting or Enameling Trim

1/12 dozen nickel-bound paint brush, 3 in. wide. Length of stock clear *4 in. for paint.* Length of stock clear *3 1/16 in. for enamel.* Bristles to be pure black Chinese, vulcanized in rubber, full stock.

A sash tool as specified for outside work is also needed.

For Wood Finishing

One of each of the following is needed:

1/12 dozen stain brush, tin-bound flowing style, 3 in. wide. Length of stock clear, 2 in. A mixture of skunk hair and black Chinese bristles is desired, triple thick, set in rubber.

1/12 dozen shellac brush, 2½ in. wide, bound by a heavy nickeled ferrule. Length of stock clear 2⅝ in. Bristles to be pure black Chinese, vulcanized in rubber.

1/12 dozen flat varnish brush, 3 in. wide, nickeled binding. Length of stock clear 3⅛ in. Selected Chinese bristles, triple thick, vulcanized in rubber, with a chiseled tip.

1/12 dozen oval varnish brush, No. 6/0, seamless nickel ferrule. Length of stock clear 4 in. Bristles to be pure black Chinese, cement set, and chiseled tip.

1/12 dozen flat varnish brush, 1½ in. wide, nickel bound. Length of stock clear 2⅜ in. Bristles to be selected black Chinese, vulcanized in rubber, triple thick, with chiseled tip.

For an extra-fine job of wood finishing or for lacquer.

1/12 dozen auto finishing brush, 2½ in. wide. Stock to be a mixture of red Ox hair and white French bristles, 2 in. long, clear, quadruple thick, vulcanized in rubber. The binding should be double tin flowing style ferrule.

The inexperienced may find it hard to tell whether the proper brush has been received. There are several simple tests, however, that will help. Hold the brush close to the ear and run the fingers through the bristles causing them to swish past the ear. There is a distinct difference in the sound made by a live bristle brush from that made by a fiber bristle.

Another method of detecting a mixture of fiber bristles is to feel the tips, especially on a chiseled brush. A fiber bristle will flatten out when cut and it is therefore possible to feel the enlargement of the bristles at the end instead of the gradual tapering off found in the real bristle.

A real bristle may be split at the end, but they are less apt to curl and mat than a fiber bristle.

A trip to a brush supply house will be time well spent before ordering brushes.

A New Practical-Arts Building

*L. F. Ashley**

The practical-arts building at the Eastern Illinois State Teacher's College, Charleston, Illinois, was completed in August, 1929, although it was occupied as early as the spring term of 1929 for instructional purposes.

The dimensions of the completed building are 80 by 186 feet. The building is of modified Gothic design, with the exterior facing of red face-brick and a limestone trim. Corridors and stairs are finished in terrazzo and the classrooms with face-brick, with walnut and green enamel trim.

The basement contains the lumber storage room, glueroom, finishing room, and the electrical construction, sheet-metal, and ceramic shops.

On the first floor are located the general metal and auto-mechanics shop, the drafting room, the printshop,

PRACTICAL-ARTS BUILDING, EASTERN ILLINOIS STATE TEACHERS' COLLEGE, CHARLESTON, ILLINOIS

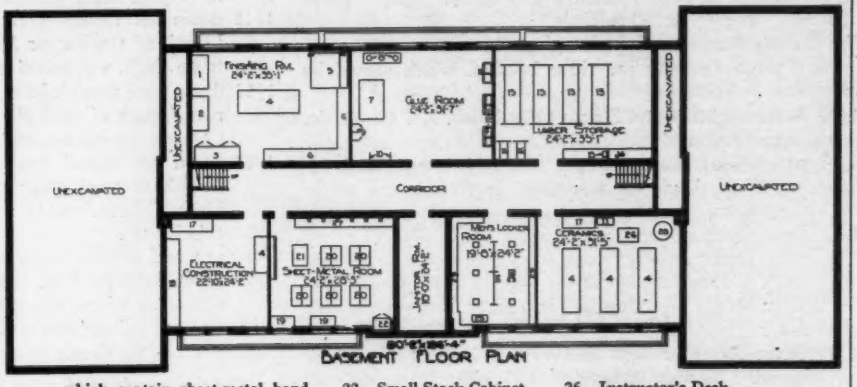
*Director, Department of Manual and Industrial Arts, Charleston, Illinois.

the millroom, and the woodworking shops. Here are also found the director's office, the critic teacher's office, and a demonstration classroom.

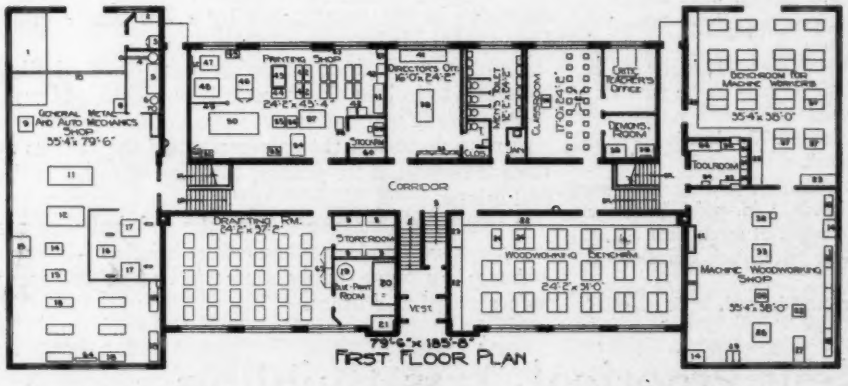
On the second floor are the domestic-science rooms—sewing rooms, dining room, kitchen, food laboratory, etc.

The cost of the building is about $135,000. In addition to this, about $35,000 was spent for new equipment, to which may be added the estimated amount of $15,000 to cover the old equipment, making the total cost of building and equipment about $185,000.

1. Table for Containers
2. Varnish and Stain Cabinets
3. Paint and Lacquer Cabinets
4. Table
5. Spray Booth 6 by 6
6. Shelves
7. Glue Horses
8. Glue Pots
9. Hand Screw
10. Bar Clamps
11. Sink
12. Laundry Trays
13. Lumber Racks
14. Cut-Off Table
15. Swing Saw
16. Short Lumber
17. Case
18. Bench
19. Stake Tables
20. Tables on which are mounted turning, burring, crimping, wiring machines — circular shears, setting-down machines, bar folder, punch, seamer, groover, vises. These tables are single manual-training workbenches, regular size, back to back as in bench-rooms for woodwork. They are the same size and evenly spaced in the room. Each has 6 drawers which contain sheet-metal hand tools. These are located by directory at key cabinet door
21. Cornice Brake
22. Small Stock Cabinet
23. Chairs
24. Coat Rack
25. Steel Lockers
26. Instructor's Desk
27. Soldering Table and Gas Furnaces
28. Gas-Heated Kiln



29. Mortiser
30. 12" Jointer
31. Sink
32. Saw Bench
33. Surface Planer
34. Dust Collector Control
35. Counter
36. Cases
37. 24 Benches
38. Table
39. Bench
40. Arm Chairs
41. Desk
42. Type Cabinets
43. Imposing Table
44. Galley Cabinet
45. Make-Ready Table
46. Pressroom Cabinet
47. Platen Press 8 by 12
48. Platen Press 12 by 18
49. Guard Rail
50. Cylinder Press
51. Roller Cabinet
52. Chase Rack
53. Punch and Perforator
54. Paper Cutter
55. Table
56. Wire Stitcher
57. Bindery Table
58. Proof Press
59. Desk
60. Stock Shelves
61. Lavatory
62. Tool Panel
63. Imposing Sticks
64. Lathe Dog Rack
65. Drawing Boards and Instruments



1. Auto Engines and Chassis in Space
2. Desk
3. Cabinet
4. Compression and Tank
5. Welding Table
6. Acetylene Generator
7. Oxygen
8. Arbor Press
9. Portable Crane
10. Track for Hoist
11. Radial Drill
12. Shaper
13. Milling Machine
14. Grinder
15. Drill Press
16. Power Hammer
17. Forge
18. Lathes
19. Blue-Print Machine
20. Drying Rack
21. Print Washer
22. High Shelf
23. Tool Case
24. 35 Benches
25. Saw Filers
26. Band Saw
27. Sander
28. Trimmer

1. Tables
2. Sinks
3. Stoves
4. Cases
5. Incinerator
6. Display Case
7. Desk
8. Cupboards

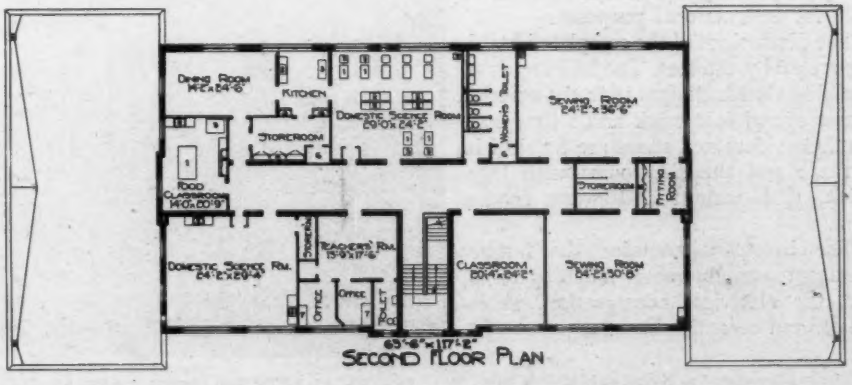


FIG. 3. THE FINISHED STOCKADE

Projects That Add Harmony to Camp Life

*Joseph A. Miecikoske**

OF the three camps operated by the Detroit Y.M. C.A., Camp Ohiyesa is the nearest to the city. The latter part of every June, this camp, which is approximately 60 miles from Detroit, is placed in readiness to accommodate the hundreds of boys who are eagerly awaiting the arrival of the proper time for their turn to spend an enjoyable period. Of the ten weeks, the first six weeks are given to the privileged boys, while the remaining four weeks are reserved for those for whom financial provision have to be made by the various branches of the Detroit Y.M.C.A. and by men, preferably business men, who have actually taken an interest in the boys. Therefore, these boys are classed as underprivileged, although at camp they are given very much the same treatment as the former class.

As the boys arrive at camp, one cannot help but notice the eagerness with which they want to enter the routine of camp life. The majority of the boys want to make their limited stay a success, and do everything to have a real honest-to-goodness time. Due to this

*Supervisor Boy Hobby Club Work, N. E. Branch, Detroit, Y.M.C.A.

FIG. 1. TRANSPORTING THE "BIG CHIEF" ON A MODERN VEHICLE
FIG. 2. ADDRESSING THE "BRAVES"

FIG. 5. THE TOTEM POLE UNDER CONSTRUCTION
FIG 6. PLACING THE TOTEM POLE DIRECTLY IN FRONT OF THE STOCKADE

interest, the camp staff set about to prepare a special program for the boys.

The greatest amount of interest is centered on the desire to imitate the Indian and his ways while at play. As a special privilege, the campers were promised to have the opportunity to participate in an Indian powwow, although facilities for this big event were very scarce.

the dome over this outdoor gathering place. Figure 4 gives an idea of what actually took place within the stockade.

A stockade is not complete unless it has a totem pole. To supply this, a group of boys got together and decided to make one which was to be placed outside of the entrance of the stockade. A quaking aspen was selected, the tree felled, its limbs were trimmed off and

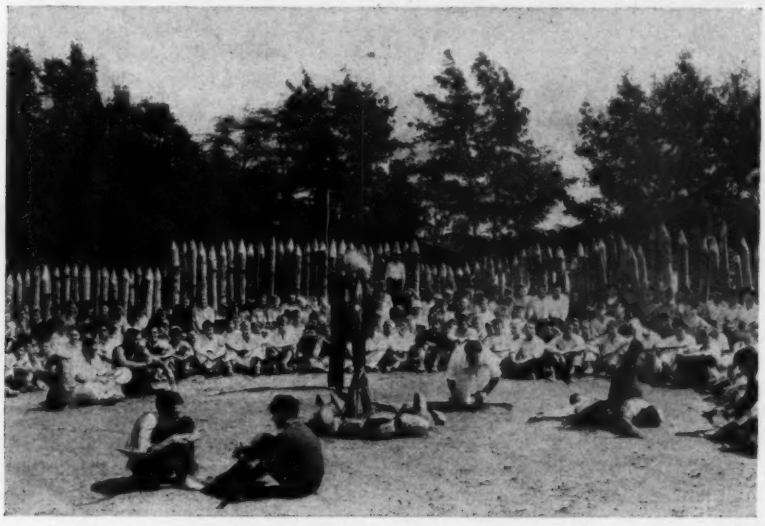


FIG. 4. THE COUNCIL IN SESSION

Figures 1 and 2 show the boys in their Indian paraphernalia. Note particularly how modernistic the Indian procession had been made, and that the Big Chief shows a fancy for modern means of transportation.

In order to develop a more Indianlike environment, plans were drawn up for the construction of a stockade. This is shown in its complete stage in Figure 3.

It took nine weeks to complete this enterprise. Over a thousand boys helped to fell the trees, cut them to lengths, excavate a circular trench and set the poles in place. During the last week of camp, the powwow was finally arranged. When the Zuni call was heard, all the boys joined the long single file on its way to attend the council in the newly built stockade. The chief, of course, presided. The boys filed into the inclosure where they were told to sit on the ground. Then the council fire was lit in the crude Indian way, ranger reports were read, Indian legends related, games played, dances held and cunning tricks exhibited. All of this was made more enchanting by the star-laden sky which formed

the bark removed. When dressed, the pole measured 12 in. in diameter, and 20 ft. in length. It was decided that the pole should rise 17 ft. above the ground. A variety of Indian symbols and pictures were drawn on the pole, and then carved out with chisels and gouges.

About 3 ft. from the top, a circular shield with a picture of a stockade and an Indian village was placed. Then commenced the construction of a large wing, which was to be mortised into the pole at the top. Luck was with the boys for they found a limb which resembled the shape of a wing. This was planed down on the top and bottom sides, and poplar saplings, which were split into halves lengthwise, were nailed on, giving the whole the appearance of a perfect wing. The next thing was to make a monstrous head to fit on top of the pole. A senior boys' counselor took this job and as a result of two day's toil he had carved out a head. It was touched up with a few colors, nailed on the top of the pole, and then the entire pole was given a coat of shellac to protect it against the elements.

Organizing and Teaching Industrial Mechanics

*G. H. Snaddon**

A General Shop Course for High Schools

INDUSTRIAL MECHANICS is a comparatively new elective course in the curriculum of the Detroit senior high schools. It is the outcome of a reorganization of the industrial-arts courses made necessary by the reorganization of the Detroit schools on the 6–3–3 plan. At Central High School the course was first offered when the new building was opened on Roosevelt Field in January, 1926. Since that time there has been a steady increase in enrollment until at present there are 126 tenth-, eleventh-, and twelfth-grade boys in attendance. An analysis of the choice of curriculums selected by these students reveals that 57.1 per cent are pursuing the language or college-preparatory course;

*Head Industrial Arts Dept., Central High School, Detroit, Michigan.

29.4 per cent the general course; 8.7 per cent the commercial course; and 4.7 per cent the technical course.

Course Organization

The course is outlined for one year's work and is designed as Industrial Mechanics (1) and (2). Classes meet seven 45-minute periods per week — two double periods on consecutive days and three single periods. In general, one or two single-hour periods each week are devoted to class discussions, lessons, tests, and the like, on related and supplementary informational material. During the first week or two of the semester much of the class time is usually devoted to the informational and the group instruction phase of the course. As a rule, two periods are devoted to examinations at mid-semester and also during the last week in each semester.

The remaining periods are devoted to laboratory problems providing practice in, and acquaintance with, modern manufacturing methods of production on a modified scale. Specially designed and simply constructed tools, jigs, fixtures, and the like, are used in one unit of the work to produce such useful articles as wrought-iron desk and floor lamps, fern stands, hacksaw frames, electric toasters, and so forth. Work with tools, materials, and machines is to clarify ideas and cultivate habits, and develop attitudes and appreciations of values relative to the production, distribution and use of industrial goods. The handwork is not for the development of skill as an end, but as a means of developing understanding and providing concrete illustrations and applications of life experiences, in the underlying industrial processes which constitute the bases of the class discussions and form the kernel of the entire course. Handles are cast on screw drivers, for instance, to illustrate the die-casting process which is discussed in class lessons, and the information thus obtained is written up in the form of an information sheet.

Industrial mechanics is modernized industrial arts — a study of the industries for the values that such studies have in the pursuit and interpretation of daily life. Instead of book materials assigned to be learned or manipulative tasks or exercises assigned to be performed, industrial mechanics furnishes educative and social experiences to be derived from purposeful reading and discussion, solving construction problems, investigating and observing immediate industrial problems and phases of industry, conducting minor research activities, and working and coöperating with others in groups toward a common end in safety committees, as foremen, and the like.

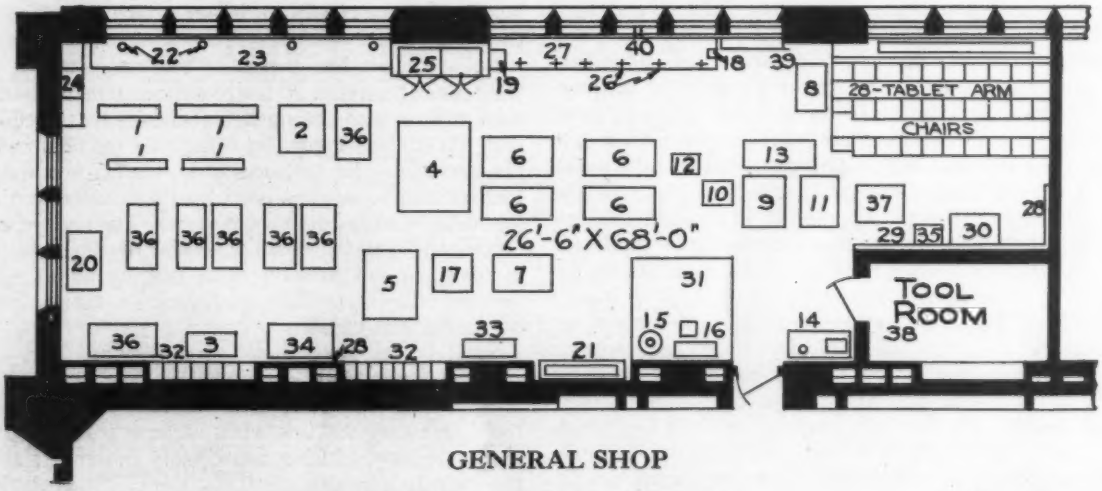
Classes vary in size from 25 to 30 students, the normal seating capacity provided being 28 tablet-arm seats.

The size and layout of the room and the present equipment are shown in Figure 1.

Course Content

Six diversified lines of work constitute the course content. These subjects are taught in one room simultaneously and are as follows: (1) Building industries; (2)) essentials of electricity; (3) machine-tool operation, including benchwork, use of jigs and fixtures, and heat treatment of metals; (4) applied sheet-metal problems; (5) automobile manufacture and maintenance; (6) wood patternmaking, including molding and wood turning.

A manual of instruction in book form, size 8½ by 11 in., for the first mentioned of these selected activities is tentatively completed, some manuals are being used experimentally in mimeographed form, while others are in preparation. These manuals, for student's use, contain a series of instruction sheets on related manufacturing processes, and other related material together with a series of core jobs with accompanying job sheets. The contents for the manual on the building industries, for example, includes kinds of buildings, masonry ma-



GENERAL SHOP

1. Wood Lathes
2. Grinder
3. Squaring Shears
4. Milling Machine
5. Band Saw
6. Metal Lathe
7. Motor Stand
8. 2 Axle Assemblies
9. Motor Stand
10. Power Hack Saw
11. Bar Folder and Forming Machine
12. Tool Grinder
13. Tinner's Stakes
14. Soldering Bench
15. Melting
16. Forge
17. Drill Press
18. Burring Machine
19. Arbor Press
20. Molding Tub
21. Wash Bowl
22. Low Voltage Outlets
23. Electrical Bench
24. Stock Bin
25. Tool Cabinet
26. Vises
27. Wall Bench
28. Bulletin Boards
29. Blackboard
30. Study Table
31. Brick Floor 7 by 7
32. Lockers
33. Steel Cabinet
34. Bench Jointer
35. File
36. Benches—Woodworking
37. Desk
38. Mezzanine for Lumber Storage 7 by 12½
39. Control Switch
40. Exhaust Fan

terials, brick manufacture, masonry operations, carpentry materials and operations, plastering materials and operations, plumbing, gas manufacture and its use, wiring, paint, varnish and stain, window and plate glass manufacture, and the legal side of building. The job sheets included are: laying out of a building, concrete construction, to leveling and plumbing, rafters, to cutting and threading pipe, wiring, glass cutting and glazing.

In general, the headings used for the job sheets are: the processes involved; a statement of the problem; specifications; procedure, with explanatory statements, safety precautions and specific references; appraisal; tools used; references; generalization or questions; and topics.

These manuals are being prepared by the industrial mechanics committee under the direction of Mr. J. H. Trybom, director of vocational education, and are being published when completed by the authority of the board of education.

Methods of Teaching and Teaching Devices Used

The methods of teaching chiefly employed are the socialized, purposing, individualized, and demonstration methods. The teaching procedure by which the desired results are achieved at any particular moment oftentimes necessitates the use of any one, or all, of these modern methods at the same time. Continuous effort is made to improve the quality and extent of the instruction, by carrying on experiments in the hope of discovering, if possible, better methods and means of doing things and to find better things to do. A particular problem is used only until a better one is found to replace it. Details of daily routine are changed when found to be for the general good.

Individual and group demonstrations are usually brief. Students are allowed to attack the problem themselves as soon as possible.

Provision is made for individual instruction and progression by making systematic tours of the class during working periods, rendering assistance in one form or another when the student has reached the point when he feels the need for additional instruction. This assistance may take the form of a suggestion or question in one case, stimulation to better effort or more action in another, correction of wrong procedure one moment, explanation of a blue print or tool adjustment the next, a brief demonstration in one group, or the checking of a completed problem in another. Perhaps changing a student's attitude may be the best help for him. Individual differences are also recognized by assigning tasks suited to the varying abilities ordinarily displayed by young learners in matters of application, interest, and the like. This individualized program reaches its limit when at times during the semester every student in the class may be engaged on a different problem. In all of the teaching an effort is made to stimulate independent thought and action rather than simply give out information or merely present facts.

An attempt is being made to unify and correlate the various activities represented in the course wherever and whenever possible. The plan being worked out is to have students in the patternmaking group, for example, mold and cast the patterns they make. Later on these students will machine these or other castings, then assemble them into useful, usable products. A group may begin, of course, at machining and assembling and later transfer to patternmaking and molding, according to their individual progress. This unification theory is being carried out still further by designing and making problems and projects that involve operations and experiences in a variety of types of work before they are finally completed. Some of the finished articles may be purchased by the students for the cost of the material involved, while others may be used throughout the entire school system. Articles needed for the general upkeep of the room are also made, including wood and metal lathe centers, file and chisel handles, and the like.

When a student has completed the required work in a particular group satisfactorily, he changes places with the student in another group who has satisfied the requirements there. This revolving plan provides for a complete variety of experiences for each student. Students help each other over the ordinary beginning difficulties. Requirements as to the kind and quantity of work expected from each student ordinarily must be determined by individual capacities, for slow students do not accomplish as much in each group and as a result could not get around to all groups. Additional assignments are provided for the fast students.

Students are seated alphabetically and also advantageously to facilitate checking daily attendance and as a means of improving class control and management. All students are required to be in their assigned seats when the tardy bell rings at the beginning of the hour. At the end of the laboratory period no loitering about the room or around the door in groups is permitted. If the student is prepared to leave the room before the passing bell rings, he is again required to be seated quietly in his place, where work is assigned to him.

A study table containing reference material, pamphlets, magazines, and catalogs is provided in the room. Most of the reference material is loaned from the school library for the year. References specified in the job sheets refer chiefly to the material to be found on the study table.

Each student has charge of the toolroom for one week each semester. A toolroom assignment chart is used with names arranged alphabetically thereon so that the student knows by consulting the chart when his turn comes for toolroom duty. On his first day of toolroom duty, he is assisted by the student who has just completed his week's experience. The student thus becomes acquainted with the general routine, locations of tools, and so forth, without causing undue interference with class efficiency. Absence is taken care of by special assignments.

Special tool boxes have been designed and constructed for holding wood-turning tools. By such an arrangement it is possible for students to get all the tools necessary for this work at once from the toolroom, thereby reducing unnecessary movement about the room to a minimum.

Student Participation

Students are appointed in each class to take charge of the necessary routine duties connected with classwork. Each group has someone in charge acting as foreman whose chief duties are to help fellow students over

their difficulties to see that all tools and materials are returned to their proper places, and to supervise the cleaning of the room and machinery at the end of the period. A reliable student acts as superintendent among other things making a general survey of the room at the end of the hour and reporting on its condition to the instructor. The opening and closing of windows, class lockers, and the like, are other duties assigned to students. In brief, any worth-while task needed to be done is in charge of some student. These assignments are changed frequently during the year. All students are made to feel that they are a part of the class and the school and the help of all is enlisted to create the desired *esprit de corps* in the group.

Students are given ample opportunity to contribute to class discussions and to express their opinions on matters under consideration. They often appear before the class and make reports. Briefly, the lesson period is one of learning chiefly through questioning and discussions between students, between students and teacher, and vice versa. The use of the question in teaching the industrial arts was presented in an article by the writer in the December, 1927, INDUSTRIAL-ARTS MAGAZINE.

In course (2) each student writes a notebook on the topic in which he is most interested. This is done outside of class time. The choice of topics is usually limited to the lines of work covered by the course, and the students are guided somewhat in their choice. Such a broad topic as electricity, for example, is not recommended, because the student cannot do justice to it with the time at hand. However, he can choose electric refrigeration, electric welding, and other similar topics in the field of electricity which are well within his capabilities and capacity. The notebook contains a preface, table of contents, and, in general, an illustrated description of manufacturing processes and products. The illustrative material is secured mainly through visits to industrial plants, through correspondence with manufacturing establishments, and from current magazines or other publications. Notebook requirements are carefully presented and suggestions are given the first week of the course, so that the student can decide on a topic and begin immediately to plan his notebook.

The student's contribution may take the form of an exhibit. Several splendid exhibits made by former students are now hanging about the industrial-mechanics room. They include: The Manufacture of an Emery Wheel, showing the process from the raw material to the finished article; lubrication; examples of drop forging; building materials; samples of various kinds of wood; etc.

Progress Record Card

A progress record card is used on which the students keep a record of their accomplishments. The card is shown in Figure 2. It is practically self-explanatory. Both sides are printed alike thereby providing for a year's record.

Many diverse and difficult teaching problems arise in the organizing and teaching of a general shop course in which the basic instructional unit is modern manufacturing processes, and which has for its chief object, the student's general education and training regardless of his future vocational choice. In this article the writer has simply attempted to outline briefly the methods, principles, and procedure followed, in an effort to solve some of these problems with heterogeneous groups in a high school with an enrollment of approximately 2,600 students.

Summary and Suggestions

1. Decide the contents and scope of the course with regard to (*a*) units of work, (*b*) equipment, (*c*) informational content, (*d*) laboratory problems.

Name_____ Grade_____
Last Name Given Name

CHECK COURSES { I.M. (1) I.M. (2) COLLEGE GENERAL COMMERCIAL TECHNICAL

Study Hall_____ Group_____ Hour_____

No.	PROBLEMS	Date Beg.	Date Fin.	Total Time
1.	Automobile			
2.				
3.				
4.				
5.				
1.	Building Industries			
2.				
3.				
4.				
5.				
1.	Electricity			
2.				
3.				
4.				
5.				
1.	Machine Shop			
2.				
3.				
4.				
5.				
1.	Patt. Mk'g and Molding			
2.				
3.				
4.				
5.				
1.	Sheet Metal			
2.				
3.				
4.				
5.				

	1	2	3	4	AV.
I. LABORATORY WORK					
1. Workmanship (quality, etc.)					
2. Interest					
3. Conduct and Attitude					
4. Application (Industry)					
5. Co-operation and Class Spirit					
6. Orderliness (ret. tools cleaning, etc.)					
7. Care in using Tools and Materials					
8. Carefulness and Judgment					
9. Tool Room Duty					
II. CLASS WORK					
1. Participation and Discussions					
2. Tests					
3. Examinations					
III. ATTENDANCE (Absence and Tardiness)					
IV. NOTE BOOK or EXHIBIT					
1. Written Work					
Remarks: AV.					

FIG. 2

2. Design and write the necessary job sheets, information sheets, etc., for each unit of work represented.

3. During the first week of each semester, the time can be profitably spent in illustrated lessons and discussions on such topics as shop safety, purpose and requirements of the course, purpose of the progress record card, notebook requirements and the like.

4. The layout of the room needs careful thought and planning. The most efficient size of room and the best kind and arrangement of equipment for a high-school general shop has not yet been scientifically determined.

5. Combining of courses should not occur. Courses (1) and (2) cannot be handled together without repetition for the students in Course (2) during the group instruction phase of the work.

6. Provision should be made throughout the course for individual instruction and progression.

7. Do not allow the course to crystallize. Constantly seek improvement in method and content.

8. Interesting, worth-while projects and problems involving operations and experiences in a variety of types of work before they are finally completed, seem to be the best.

9. Revolve or change individuals rather than groups.

10. Provide a study table with ample references.

11. The tool crib and tool cabinets cannot be too carefully arranged and checked. The rule "A place for every tool, and every tool in its right place" must be strictly enforced.

12. Organize the personnel of each group so that students will effectively direct and supervise most of the activities.

13. Make provisions whereby students can keep a complete record of their accomplishments.

14. Humanize and socialize the work in addition to mechanizing it.

15. Use all the visual aids and other illustrative material that can possibly be obtained.

16. Sell the course through written articles in the school paper, pictures and articles in the school yearbook, visiting days for parent-teachers association, exhibits, and so forth.

Selection and Organization of Related Subject Matter

*Paul B. Moran**

RELATED work has been, and is at the present time, often thought of as arithmetic, science, English, and other subjects taught for their own sake alone and simply for the knowing. Related work must grow out of the performance of useful labor, so if the subjects enumerated in the foregoing do appear under the title of related work, it is because they directly enter into the daily work of the student. The purpose of teaching related work, therefore, is to enable the boy or girl to better understand his or her job and to more successfully solve the problems which are met in actual life.

Related work, then, may be defined as everything which is needed in the acquiring and using of craft information, and in the planning and construction of a usable product.

The selection and organization of the subject matter is a vital problem to the shop teacher. Pupils come into the shop after having competent teachers in their academic classwork. If the methods of these teachers have failed to put the information across to the pupils, surely the same methods used by the shop teacher would bring no better results. The teacher of related work, therefore, must select and organize his material in a much different way from that used by the academic teacher.

Since the problem of selection and organization is such a vital one, and in order that the shop instructor might best select the teaching points to be brought out, it is equally important and absolutely necessary that he clearly understands the mechanics of selection and organization of related subject matter. To be of greatest value, this material should be obtained from the schedule of operations.

The mechanics of selection consists in the following:

1. Analyzing each operation step for its related work in the light of established objectives.
2. Listing the lesson topics and assignments discovered in the analysis.
3. Appraising the topics and assignments listed.
4. Selecting the topics and assignments for inclusion in the program of instruction.
5. Organizing the selected topics for presentation.

A very successful method of analyzing each operation step is to apply to the step a number of so-called key questions. These are found under two main heading questions, namely: What *work planning* is involved? and What *knowledge and use of craft information* is involved?

Under the work planning, appear questions in regard to the making and reading of drawings, use of tools and machines, considerations for safety, estimating of time, and ultimate use of product. Under *knowledge and use of craft information*, appear questions concerning functions of tools and machinery, elements of science in control of process, and trade customs and conventions used.

These questions are applied to each operation step, and all lesson topics suggested are listed. This procedure appears to the beginner to be quite needless and in too much detail, but it is, in reality, the very process which one goes through in planning any good job. After a little practice along this line, the process becomes habitual.

After analyzing and listing the topics, the next thing is to appraise them by applying standards of evalua-

*State Normal School, Fitchburg, Massachusetts.

tion. Probably this is best done by applying the four fundamental factors of selection which are: *Objectives, learner, time,* and *facilities available.* To show that these factors are involved to a great extent in the selection and organization of subject matter, the continuation school may serve as an example.

The objectives of the continuation school are:

1. To further general education.
2. To make the most of existing conditions.
3. To train youth in vocation.
4. To establish coöperative relations between the employer and the school.

It may be seen that these objectives, in part, are quite different from the objectives of the grammar and high school. Thus, methods of selection and organization must be different.

The learners in the continuation, grammar, and high schools, are all different in attitudes and interests, and it is evident that differences in selection are absolutely necessary.

The time element plays a big part in the selection and organization of subject matter for the continuation school and high school. From a full-time, five-hours-a-day, five-days-a-week pupil, to an employed youth with only four hours a week in school, is quite a change and consequently, methods of selection and organization also must be quite different.

In considering the facilities available, it might be pointed out that the continuation school often is obliged to use the same facilities as the high school. Using these same facilities, for doing a different kind of work, requires intensive planning, selection, and organization on the part of the continuation-school teacher.

After appraising the topics and assignments, the ones most suitable are selected for inclusion in the program of instruction. The operations of appraising and selecting really go on at the same time. These topics are next organized in the way in which they might be most effectively presented.

The outstanding requirement in the organization of selected topics for presentation is that the material shall be in independent day units. The teacher cannot depend upon the work of the previous week or job to hold over. Each unit should, however, contribute to the course objectives as well as to the single-job objective, so that when all of the unit lessons are completed by any one pupil, the result will be a well-rounded development of planning skill and the ability to utilize craft information on the part of the pupil.

Another outstanding requirement is that the unit should be developed about one central core, job, idea, or item of trade knowledge which may be correlated in a perfectly natural manner to some phase of the manipulative work carried on in the shop. This core may be a trade operation, part of a project, an entire project, a trade principle, a tool or machine, etc.

The most direct way to develop skill in organization is by means of preparing lesson sheets for use by the pupils in class. These sheets may aid the teacher and supplement his instruction by outlining the instruction, setting the problem, or assigning the work for the pupil. From the outset the *lesson sheet* as well as *job sheets* should be regarded as a teaching device which the teacher uses only to supplement his own efforts to meet definite teaching situations.

In related work sheets, subject matter should take the form of problems arranged as nearly as possible in the order and form in which they occur in natural activities. Academic headings, such as arithmetic, English, etc., are of no advantage as the title of a sheet and tend to make the pupil and teacher regard the work on subjective point of view rather than the project point of view.

Each instructor should determine the conditions under which the following assignments may be used to the most advantage:

1. Drawings to be made or read.
2. Directions to be followed.
3. Information study assignment.
4. Problems to be solved.
5. Cases and points for consideration.
6. Forms to be filled out.
7. Questions to be answered.
8. References to be used.
9. Combinations of the above.

Much related work is carried on in the shop. A great amount could not be carried on elsewhere with any degree of accuracy and value.

When the public obtains a clear idea of the manual and especially of the related work carried on in the shop, they will look upon industrial-arts work in the light for which it was instituted, and forget the view that shopwork and its related subjects are *new-fangled* ideas put into the school curriculum to crowd out the "three R's."

DRAFTING ROOM, NORTH JUNIOR HIGH SCHOOL, EVERETT, WASHINGTON

INDUSTRIAL-ARTS MAGAZINE

J. J. METZ, Editor

WHAT'S IN A NAME?

Shakespeare, more than 300 years ago, put the words "A rose by any other name would smell as sweet," into the mouth of one of his characters. No one would want to question the truth of this statement, and yet a name once given, is soon so clustered about with memories and associations that it is extremely difficult to alter or efface it.

About 16 years ago, the INDUSTRIAL-ARTS MAGAZINE made its first appearance, and under that name it has made thousands and thousands of friends. The name chosen for it at that time has made an indelible mark on its reading public, and it is only the stress of necessity which prompts a change in it now. When it was first chosen, it encompassed the widest field of work covered at that time in the school shop. It was much more comprehensive than the term "manual training" which was prevalent at that time, because as Vaughn and Mays say in their *Content and Method of Industrial Arts*, the phrase industrial arts is "simply another attempt to name more appropriately the work which has been growing and enriching and broadening under the old names of manual training and manual arts. It broadens the conception of the work in that it comprehends a greater value of activities that give insight and appreciation concerning all those 'arts' that industry employs to do the work and produces the goods of the world."

Sixteen years have elapsed since the first copy of the INDUSTRIAL-ARTS MAGAZINE came fresh from the press, and during those years the world has made much progress. Naturally this affected the curriculum offerings in the school also, and hence the work in the school shop today presents quite a different aspect from what it was in 1914.

Succeeding issues of the INDUSTRIAL-ARTS MAGAZINE faithfully pictured the changes in the shopwork of the school — yes, it did even more — it predicted and suggested them, so that nothing in the content of the magazine was ever lacking to give a full and complete portrait of what was taking place, helping the shop teacher, supervisor, and school administrator alike in keeping abreast of the latest and best that was being offered in the industrial-arts and vocational-education field in this country and abroad.

Because of the name, however, misunderstandings on the part of those not acquainted with the magazine were possible, and they actually did arise. To obviate this occurrence, it is necessary, then, to change an old name that has become firmly established and universally respected, even though sentiment might prompt against making the change.

Fortunately it is not necessary to make much of an alteration. The addition of just two words changes the name so that it encompasses the entire field, as the contents of the magazine has already done these many years.

This change of name will be put into effect with the June issue, and from then on the INDUSTRIAL-ARTS MAGAZINE will be known as INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The policy of the magazine, however, will remain unalterably constant. It will henceforth, just as it has in the past, strain every effort to be of the greatest use to the greatest number of those interested in teaching industrial-arts and vocational subjects.

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HENRY FORD'S VOCATIONAL-SCHOOL ASPIRATIONS

The American people have been the recipients of many legacies left to them by men of exceptional wealth, to be expended in the cause of humanity, and much of this great stream of wealth has gone into the educational and charitable institutions of this country. In most cases this money was given with unselfish motives, the gift being prompted by purely patriotic and humanitarian considerations.

That Henry Ford, who is one of the wealthiest men of the nation, would apply some of his millions to the cause of humanity, was confidently predicted. Just where those millions would ultimately go no one knew. That he expects to confer his beneficence upon industrial education is entirely in keeping with the marvelous career of the man and the manner of accumulating his wealth.

In announcing his intentions he makes it plain that he does not want advice as to how he should spend his millions, from men who have never learned how to earn or save a dollar. In other words, he will, with a characteristic independence of thought and action, find his own way and reach his own conclusions. That is typically American in spirit and manner.

One thing is clear. He will turn his attention to the cause of vocational education. He has trade schools in mind. Besides, he has been in intimate touch with this type of education and knows well its purpose and value.

Mr. Ford's choice of this type of education as the proper recipient of his generosity, is entirely logical and sound. While the vocational training has reached a commendable development in various sections of the country, this being particularly true in certain industrial centers, it has not in the main reached that fullness of service which its best possibilities promise or warrant.

This country which is exceptionally blessed with natural resources is yet to acquire a mastery of that art and science which converts all these resources to the ultimate uses of man. The industrial centers of Europe draw upon our raw materials and sell back to us much of the finished product. An ingenius and skillful labor constituency must be reared in our own country if we are to hold our place in the markets of the world. The progress in mass production must be augmented by a mastery of that art, and science, which goes into the production of the finer and more precious articles, and which, in a competitive sense, we have thus far been unable to produce.

There can be no doubt that there are many regions in the United States where vocational schools will become the forerunner of a new impetus and vitality to the nation's industrial achievements, and it is to be hoped, to the nation's supremacy in the trade marts of the world.

TAKING TIME BY THE FORELOCK

The end of the school year is approaching with its accustomed regularity and with more than uncanny swiftness. Visions of vacation-time activities may and do appear as more or less nebulous clouds drifting across the horizon of our mental activities. At times these clouds cast a shadow over other and more important matters that are occupying our mental capacities. At such times, the victim becomes cognizant of the spring fever and wanderlust that has taken hold of him, and it requires stern measures to drive the laggard brain to take up the more important matters that may require his attention.

It may be helpful therefore to list a few of the things that must be attended to between now and the close of school, in order to make absolutely sure that they be taken care of in time.

The first and most important duty is to list the items that have to be requisitioned for the immediate future as well as for the next school year. Before doing this, it may be well to read, or review if it has already been read, Mr. Bedell's article on "Specifying Equipment and Supplies for School Shops" on page 163 of this issue.

After having determined what must be bought in the way of equipment, materials, and supplies, there are numerous other items that need consideration.

Do the old tools, machinery, and equipment need attention in order to bring them up to par? Can the boys' help be enlisted in doing the job? Some of the problem boys at times become veritable wonders when confronted with a real job that bears some responsibility with it. Organization, of course, is needed before tackling a proposition of this kind, but it is worth the trouble.

Next, do the windows need some attention. Window stops, stools, and aprons may need renewal, some panes may have to be replaced. Shades may need adjustment and new cords. Fine, let's instruct the boys to take care of the home mechanics of the classroom .

How about the floor? Does it need to be repaired in places? Does it need to be painted? Has it become so slippery that it is dangerous?

How do the walls and the ceiling look? Have holes developed in the plaster which need repairing? Do the walls need a coat of paint?

Doors in the school shop usually receive rough handling. Can they be reconditioned in the school shop?

Can the material storage racks and cabinets be improved? Is the storage for partly completed projects adequate, or can the accommodations for this purpose be increased by a little extra labor?

Do the electric fixtures and the power wiring need any attention. These things had better be checked up and put in order before school closes.

Have the projects been chosen for the next school, county-, or state-fair exhibits? Is the work on them progressing satisfactorily? Will they be ready in time?

How about the inventory? This work can be made much lighter if preparations for it are started now.

The foregoing is just a checking list which may be used to prepare systematically for the close of the school. This avoids the inevitable hustle and bustle which accompany the last-moment rush in which many necessary items that need and deserve attention are overlooked or ignored.

MOVIES IN THE CLASSROOM

The motion-picture projector in the school is not new, yet it is not used as efficiently as it might be in many classrooms. Today, where so many films on industrial subjects are available, many of them free of charge, others at a nominal rental, it seems that every shop teacher ought to have access to a projector whenever, in his opinion, a lesson can be more easily demonstrated or a bit of related material more thoroughly explained.

The cost of these projectors no longer is excessive, and their use in the classroom ought to be encouraged as much as possible. Of course, there is a right and a wrong way of using the films. The teacher who darkens his room on a hot afternoon and starts to grind off a film which will take 30 minutes or more for the full presentation, is not doing a real good piece of educational work. He has merely provided a soothing lullaby which will assist his students to fall asleep without more ado. The use of the movie in the classroom must be made dynamic just as any other teaching method must be dynamic if it is to arouse interest and hold the attention of the student. A few words of explanation can always be interspersed while the film is being run off. Questions also can be asked so that the learner will always be kept on the alert.

There are many schools which could even extend the help which they give their teachers by providing moving-picture cameras as well as projectors. With such a camera at hand, the teacher is in a fine position to gather material which will be invaluable to him in the classroom.

Some of the movie apparatus now available, permits of making slow-motion pictures so that tool processes can be explained very much more thoroughly by the movie method than could be done by the ordinary demonstration methods used heretofore.

There is no question of the great educational possibilities of the film, and the shop teacher ought to try to make the greatest use of this invention in his shopwork.

MAKING THE BEST OF THINGS

A courageous man makes the best of his lot. Educational activity, once begun, tends in one form or another to go on. The struggle for a livelihood is itself a school, nor small is the worth of its instruction. Happy is he, therefore, who makes the most of what his calling can teach. For sound mental growth marks the man who relates his doing and living to his learning and thinking.—*Leon Josiah Richardson.*

A Study of Standards of Attainment in Industrial Arts

(Report of the Committee, A.V.A., New Orleans, La., Saturday, Dec. 7, 1929)

IN 1928, President R. L. Cooley, of the American Vocational Association, appointed a special committee to undertake a study of standards of attainment in industrial-arts teaching.

The committee, which consisted of E. E. Ericson, State Teachers College, Santa Barbara, Calif., chairman; Charles F. Bauder, Board of Education, Philadelphia, Pa.; William T. Bawden, Industrial Education Magazine, Peoria, Ill.; Clyde A. Bowman, Stout Institute, Menomonie, Wis.; Maris M. Proffitt, U. S. Office of Education, Washington, D. C.; William E. Roberts, Board of Education, Cleveland, Ohio; and Robert W. Selvidge, University of Missouri, Columbia, Mo., was not given a definite assignment, but was allowed to carry out the work in its own way. It therefore decided to limit its work to a study of the things every boy should know and be able to do, in the field of industrial arts, by the close of the junior-high-school period.

With the coöperation of a large number of supervisors and teachers, lists of operations and units of related work were prepared under the six headings of woodworking, household mechanics, electricity, sheet-metal work, printing, and automotive mechanics.

The tables which follow may be used by shop teachers and supervisors as a basis of what is to be included in the industrial-arts program of the junior high school; or as a list against which the projects which have been selected or assigned for teaching may be checked; or as a means of checking construction and repair jobs which are often given to the school shop; to the detriment of the instructional procedure; or for adjusting any given line of industrial-arts work to varying amounts of time available. The outlines also may be used as a basis for estimating the amount and character of the equipment and supplies required for a given number of students.

In making adjustments to the requirements of each local situation, it is expected that the shop teacher or supervisor will use his discretion in adding to or subtracting from the items included in any one of the lists. It is far more important that each shop teacher have a reason for including or excluding a unit of instruction than that all should be teaching the same things.

The following Tables present summaries of the replies to questionnaires sent to 40 cities. The items are arranged in order of frequency of acceptance by those reporting. In most instances each report represents conclusions reached by a group of teachers rather than by an individual.

TABLE I. Operations in Woodwork That a Boy Should Be Able to Perform at the Close of the Junior-High-School Period

	Yes	No
1. Sharpen plane iron and other cutting tools, using cutting wheel and sharpening stones	24	0
2. Set up and operate jack plane, smooth plane, block plane	24	0
3. Set and use marking gauge	24	0
4. Square a board of soft wood to three dimensions according to standard procedure	24	0
5. Insert blade in coping saw and use properly	24	0
6. Use sandpaper correctly, with block for wood, and without block for finishes	24	0
7. Use hammer correctly for driving and pulling nails	24	0
8. Bore for screws, and drive with common screw driver	24	0
9. Apply stain, shellac, paint, and finishing wax	24	0
10. Set and use the bevel	23	1
11. Test with try-square for straightness and squareness	23	1
12. Use crosscut saw: general use, and in miter box	23	1
13. Use rip saw: ripping on vise and on horse	23	1
14. Use of backsaw for fine cutting	23	1
15. Use auger bit properly	23	1
16. Use chisel for paring on curved and straight surfaces	23	1
17. Make a structure with a curved edge, using compass saw, chisel, spokeshave, and file	22	2
18. Use knife for marking across grain with square	21	3
19. Adjust hand screws	21	3
20. Construct butt joint, miter joint, and dado joint	21	3
21. Construct and use gauges for boring to depth	16	7
22. Make a glued-edge joint, as in a table top, with or without dowels	16	7
23. Fit a small door, attach surface hinges, fit locks	15	8
Additional Units Suggested		
24. Use nail set for setting nails.		
25. Use rule for accurately measuring on wood.		
26. Make and use wooden miter box.		

Units of Related Knowledge

	Yes	No
1. How to read a rule up to and including 16ths	24	0
2. How lumber is made from logs	24	0
3. Names of not less than 15 common woodworking tools	24	0
4. How auger bits are dimensioned	24	0
5. Names of joints: butt, half-lap, mortise-and-tenon, dovetail	24	0
6. Sizes and kinds of common, casing, finishing nails, and brads	24	0
7. How to specify sizes of screws: flat, round-head	24	0
8. Grades and uses of sandpaper	24	0
9. Reasons for painting and wood finishing	24	0
10. Common wood fasteners: corrugated, brackets, nails, screws	24	0
11. Read simple working drawings for furniture, framework	23	1
12. Types of glue suitable for different work in wood	23	1
13. Causes of contraction and expansion of wood, and of other changes in shape and size	22	2
14. Difference in sizes between rough and dressed lumber	22	2
15. Principles of locating hinges and locks on doors	22	2
16. Relative costs of different woods in local community	22	2
17. How varnish is applied and rubbed	21	3
18. Wages paid in these fields of work	21	3
19. Types of wood suitable for various types of common construction	20	4
20. Use of dowels in joinery	20	4
21. Raw materials used for manufacture of stain, varnish, filler, shellac, wax	20	4
22. Use of steel wool in wood finishing	20	4
23. Scope of activity of carpenter	20	4
24. Scope of activity of cabinetmaker	20	4

	Yes	No
25. Grades of lumber commonly used: buildings, furniture	19	5
26. Difference between crosscut saw and ripsaw	18	7
27. Names of common hardware used: building, cabinet work	17	7
28. How saws are filed	16	8
29. How to judge good and bad points in woodworking tools	16	8
30. Relative strength of woods	16	8
31. How woodworking machines operate	15	9
32. Names of building materials for foundations, walls, roofs, finishes, etc.	14	10
33. Names of principal members of window and door frames, and interior trim in dwelling	12	12
34. How to test wood for proper dryness	11	13
Additional Units Suggested		
35. How to make a stock bill for a simple project.		
36. How to order lumber from yard or mill.		
37. How to keep tools free from rust.		
38. Costs of common woods used in house building and furniture.		

TABLE II. Operations in Household Mechanics That Should Be Covered by Boys Before the Close of the Junior-High-School Period

	Yes	No
1. Read gas meter	23	0
2. Replace sewing-machine belt	23	0
3. Remove glass from window	23	0
4. Fasten glass with points and putty	23	0
5. Sharpen kitchen knives	22	1
6. Repack common faucets: compression, Fuller self-closing	22	1
7. Rewire or make window screen	21	2
8. Cut window glass	21	2
9. How to use a mill file in sharpening a hoe and for other purposes	21	2
10. Attach casters and glides	20	3
11. Make concrete project requiring wood forms	20	3
12. Remove paints and varnish	19	4
13. Tie Boy Scout tenderfoot knots	19	4
14. Replace spring in mortise lock	19	4
15. Replace sash cord	19	4
16. Use corner braces and mending plates in repairing furniture	18	5
17. Use lacquer for home decoration	18	5
18. Clean out drain trap	18	5
19. Whip a rope	18	5
20. Splice a rope	18	5
21. Repair flush tank	17	6
22. Hook up and install radio set	17	6
23. Cut and thread pipe	16	7
24. File keys	16	7
25. Sharpen and adjust lawn mower	15	8
26. Repair shellac and varnish finishes	14	9
27. Sharpen scissors	14	9
28. Mix concrete and lay piece of sidewalk	14	9
Additional Units Suggested		
29. Fit a hammer handle.		
30. Wire a door bell.		
31. Repair or replace window-shade rollers.		
32. Simple upholstery.		
33. Use suction plunger.		
34. Read water meter.		
35. Read electric meter.		
36. Repair household utensils with solder or rivets or both.		
37. Mix and apply house paint.		
38. Patch an inner tube.		
39. Set up a stove and connect for gas.		

Units of Related Knowledge

	Yes	No
1. How paint and varnish brushes are cleaned and stored	23	0
2. How tools are kept from rusting	23	0
3. Names of different types of water faucets	23	0
4. Names of common locks: mortise, padlock, etc.	23	0
5. How to care for sharpening stones	21	2
6. Distinguish between different grades and thicknesses of window glass	21	2
7. Distinguish between different files for various purposes	21	2
8. How putty is made	21	2
9. How wire netting for screens is graded with reference to mesh	20	3
10. How water pipe is dimensioned	20	3
11. Names of common pipe fittings	20	3
12. How files are classified and dimensioned	19	4
13. Different mixtures for concrete for various purposes	17	6
14. Kinds of rope and method of dimensioning rope	14	9
15. How to wash sand and gravel for cement work	14	9
16. Names of parts of a flush tank	13	10
Additional Units Suggested		
17. Correct names of all tools used.		
18. Kinds and sizes of nails and tacks used in home.		
19. How to select paint brushes for various jobs.		

TABLE III. What a Boy Should Know and Be Able to Do in Electrical Construction by the Close of the Junior-High-School Period

	Yes	No
1. Connect set of dry cells in parallel	24	0
2. Connect set of dry cells in series	24	0
3. Construct an electromagnet	24	0
4. Make common wire splices	24	0
5. Solder and tape splices	24	0
6. Construct simple bell circuit	24	0
7. Construct bell circuit, using one button and two bells in parallel	24	0
8. Construct an extension cord, 110-volt	23	1
9. Connect socket and plug	23	1
10. The same circuit using one button and two bells in series (see No. 7)	23	1
11. Construct circuit using one bell to operate from two push buttons	23	1
12. Detect and remove trouble in bell circuit	23	1
13. Assemble electric iron, heater, or toaster plug	23	1
14. Construct circuit in which one button operates a bell and the other button operates a buzzer	22	2
15. Construct return-call system using same batteries	22	2
16. Test, find, and replace fuses	22	2
17. Wire miniature battery lamps	21	3
18. Connect feed-through switch into an extension cord	21	3
19. Connect transformer in 110-volt line	20	4
20. Construct simple lighting circuit, lamps in parallel	20	4
21. The same circuit in series	20	4
22. Construct and install a drop cord	20	4
23. Construct a simple buzzer	20	4
24. Construct a simple telegraph system	19	5
25. Construct simple make-and-break switch	18	6
26. Connect through a combination fuse and switch to a lamp circuit	18	6
27. Install flush switch	18	6
28. Install flush receptacle	18	6
29. Install snap switch	18	6
30. Construct a simple electric motor	17	7
31. Construct circuit of 2 or 3 lamps, each operating independently of the others	17	7
32. Use loom in running house wiring	16	8
33. Run wire using proper tubes and knobs	16	8
Additional Units Suggested		
34. Read and care for meters of voltage, amperage, and resistance.		
35. Survey of points in design and manufacture of electrical equipment for home and office use.		

Units of Related Knowledge

	Yes	No
1. Sources of electrical current	25	0
2. What are conductors and nonconductors of current	25	0
3. Principles of connecting dry cells	25	0
4. Why splices should be soldered	25	0
5. Structure of a push button	25	0
6. Structure of an electric bell	25	0

	Yes	No
7. Cause and effect of short circuits	25	0
8. Use of extension cords	25	0
9. Use of socket and plug	25	0
10. Use the fuses	25	0
11. Dangers of electricity	25	0
12. How to avoid the dangers of electricity	25	0
13. Uses of common electrical household appliances	25	0
14. How to read the electric service meter	25	0
15. General nature of electricity	24	1
16. Principles of electromagnetism	24	1
17. Uses of various common splices	24	1
18. Structure of a dry cell	24	1
19. Uses of simple and compound bell circuit	24	1
20. Sources of current for bells other than dry cells	24	1
21. Use of transformers in a 110-volt line	24	1
22. Uses of switches	24	1
23. Effects of electricity	23	2
24. Rules of bell wiring	23	2
25. Action and principle of an electric motor	23	2
26. How to figure costs per unit of consumption of electricity for household purposes	23	2
27. Principle of the common incandescent lamp	21	4
28. Common house-wiring insulation	20	5
29. When to use porcelain tubes, knobs, and wiring loom	20	5
30. Uses of motors in industry	20	5
Additional Units Suggested		
31. Uses of storage batteries.		
32. Care of storage batteries.		
33. Ohm's law and its applications.		
34. Facts regarding static electricity.		
35. Principles involved in selecting electrically driven machinery for home and office use.		

TABLE IV. Operations in Sheet-Metal Work Which a Boy Should Be Able to Perform by the Close of the Junior-High-School Period

	Yes	No
1. Transfer patterns to sheet metal accurately and economically	24	0
2. Tin a soldering copper	24	0
3. Solder various kinds of sheet metal	24	0
4. Light and operate gas furnace or blowtorch	24	0
5. Use snips properly	24	0
6. Punch holes	24	0
7. Use squaring shears	24	0
8. Use bar folder	24	0
9. Turn edges for hems	24	0
10. Form sheet metal on bench stakes and mandrels	24	0
11. Rivet	24	0
12. Lay out patterns for simple objects	23	1
13. Read a drawing	22	2
14. Make out bill of material for a job	22	2
15. Turn various seams	22	2
16. Use hand groover	22	2
17. Roll sheet metal on forming machine	22	2
18. Crimp edges	21	3
19. Wire edges with bar folder and hammer	21	3
20. Brake sheet metal for rolling	21	3
21. Use burring machine	21	3
22. Peening and setting down with hammers	21	3
23. Plan a job	20	4
24. Use grooving machine	20	4
25. Use beading machine	20	4
26. Wire edges with wiring machine	19	5
27. Shape sheet metal with raising hammers	19	7
28. Use cornice brake	17	7
29. Lay out and form hinges	15	9
30. Use setting down machine	14	10
31. Brazing or hard soldering	9	15

Units of Related Knowledge

	Yes	No
1. Kinds of solder, and their uses	24	0
2. Kinds of fluxes and dipping solutions, and their uses	24	0
3. Terminology of sheet-metal operations, tools, and equipment	24	0
4. Care of tools and equipment	24	0
5. Sources and characteristics of lead	23	1
6. Sources and characteristics of tin	23	1
7. Sources and characteristics of copper	23	1
8. Methods of manufacturing galvanized-iron sheets	21	3
9. Occupational information on the sheet-metal worker	21	3
10. Methods of manufacturing tin plate	20	4
11. Sources and characteristics of zinc	20	4
12. How to select the proper metal for a project	20	4
13. Methods of manufacturing soft iron wire	20	4
14. Standard sizes of galvanized-iron sheets	19	5
15. How to distinguish various metals	19	5
16. Standard sizes of soft iron wire	19	5
17. Factory methods and commercial production	19	5
18. Standard sizes of tin plate	18	6
19. Composition of brass and its uses	18	6
20. Standard sizes of black iron sheets	17	7
21. Sources and characteristics of aluminum	17	7
22. Methods of refinishing various metals	15	9
23. Standard sizes of copper sheets	14	10
24. Standard sizes of sheet aluminum	14	10

TABLE V. Operations in Printing Which a Boy Should Be Able to Perform by the Close of the Junior-High-School Period

	Yes	No
1. Set simple straight matter	24	0
2. Transfer lines of type from stock to galley	24	0
3. Tie forms with cord	24	0
4. Take proof press and planer proof	24	0
5. Transfer forms from stone to galley, from galley to letterboard, and vice versa	24	0
6. Correct forms from marked proofs	24	0
7. Lock small forms for platen press	24	0
8. Place forms in bed of platen press	24	0
9. Oil and wipe platen press	24	0
10. Feed simple jobs made ready by instructor	24	0
11. Remove ink from dead forms	24	0
12. Remove forms from platen press	24	0
13. Unlock forms and put away all lock-up materials	24	0
14. Tie dead-type forms on stone	24	0
15. Distribute simple straight matter and display composition	24	0
16. Remove ink from disk and rollers of platen press	24	0
17. Put away, clean, and care for all composing-room and press-room tools and material used in these jobs	24	0
18. Set simple display matter	23	1
19. Read and interpret copy marks	22	2
20. Read proofs with copyholder, marking errors with standard proofreaders' marks	20	4
21. Gather, jog, fold, punch, perforate, stitch, and pad simple bindery jobs, using hand- and foot-power machines only	17	7
Additional Units Suggested		
22. Place made-ready on press, and change drawsheet.		
23. Set pins in the drawsheet.		
24. Practice in using the gauge.		
25. Plan layouts for simple display jobs.		
26. Set simple rule jobs.		
27. Solve simple stock-cutting problems and cut stock.		

Units of Related Knowledge

	Yes	No
1. Appreciation of the contribution printing has made to civilization from earliest times	23	1
2. Typical operations characterizing each of the various printing occupations. Some of these will have been experienced by the boy during the course. Of others he will have had only informational contact	21	2
3. Fair working knowledge of the more common materials used in each of the printing occupations explored	22	2
4. Appreciation for the position of printing in the modern industrial and economic world	22	2

	Yes	No
5. Appreciation for the craftsman and his problems	22	2
6. Fair degree of skill in a few operations of each occupation explored	21	3
7. Reading acquaintance with a few of the outstanding printers since Gutenberg	21	3
8. Definite idea as to his fitness for each of the various printing occupations explored in the course	20	4
9. Working conditions, wages, advancement, hours of work, and similar characteristics of the various printing occupations	18	5
10. Characteristic mental, physical, tempermental, artistic, and educational requirements for success in the various printing occupations	17	6

Additional Units Suggested

11. How to classify type faces.
12. Understanding of kinds of paper and ink used for common jobs.
13. Knowledge of common methods of management of commercial printshops, job tickets, requisitions, etc.
14. Estimating costs of jobs, including material, labor, overhead, advertising, etc.
15. Appreciation of importance of keeping a clean shop.

TABLE VI. Operations in Auto Mechanics Which a Boy Should Be Able to Perform by the Close of Junior-High-School Period

	Yes	No
1. Adjust tension on fan belt	16	0
2. Remove and replace tire on two standard makes of wheel	16	0
3. Repair puncture with a cold patch	16	0
4. Repair puncture with a Shaler hot patch	16	0
5. Block up a car	15	1
6. Remove front wheels, replace, and adjust	13	2
7. Clean and adjust breaker points	14	2
8. Replace casing with a blow-out boot in it	14	2
9. Wire a car from a chart	13	3
10. Run a motor after finishing the work	10	3
11. Adjust brakes	10	4
12. Dismantle and assemble rear spring	12	4
13. Remove and replace radiator and fan	12	5
14. Adjust front wheels for toe-in and alignment	9	5
15. Remove, and replace valves; grind at least one intake and one exhaust valve	11	5
16. Grease a car	11	6
17. Remove and replace manifolds and carburetor	9	7
18. Adjust valve tappets to proper clearance	8	9
19. Dismantle and assemble a piston assembly	8	10
20. Dismantle, clean, and assemble a carburetor	8	11
21. Remove and replace steering gear	7	11
22. Dismantle an engine	6	11
23. Remove and replace an engine	5	11
24. Dismantle and reassemble universals and drive shaft	5	11
25. Remove and replace crankshaft, fit bearings with shims, and time engine	3	13
26. Dismantle and assemble rear end; make proper adjustments	4	13

Additional Units Suggested

27. Test and clean spark plugs.
28. Test and adjust lights.
29. Uncover and replace light bulbs.
30. Test and care for battery.
31. Remove sediment from radiator.
32. Change oil in an engine.
33. Grease a car completely.
34. Locate firing order of an engine.
35. Stop leaks at water pump.

Units of Related Knowledge

	Yes	No
1. Function and parts of the cooling system	16	0
2. Methods of circulating cooling mediums	16	0
3. Name, location, and functions of the main units of a car	16	1
4. General construction of the main units of a car	16	1
5. Chief parts of the front end of the car	16	1
6. Function of the differential	16	1
7. What an internal and what an external brake is	16	1
8. Function of the transmission	16	1
9. Why a universal is needed in a car	16	1
10. Necessity for proper inflation	16	1
11. Methods of circulating oil	15	1
12. General safety precautions in driving	15	1
13. Various kinds of wheel construction	14	2
14. Main parts, and general functions of the parts of a rear end	15	2
15. Principles of carburetion	15	2
16. Necessity for a vacuum tank or pump in most cars	15	2
17. Necessity for proper focus and alignment of light	16	2
18. Reasons for the multiple engine in an automobile	15	2
19. How to take up a bearing when shims are used	15	2
20. Meaning of camber, toe-in, caster, and alignment	14	3
21. Why one should not ride a clutch pedal	14	3
22. Chief parts of the engine, and function of each	14	3
23. Reasons why valve grinding is necessary	14	3
24. Main parts of starting, ignition, and lighting systems	14	3
25. Functions of the oiling system	14	3
26. What is meant by gear ratio	13	4
27. General difference between sliding-gear and planetary transmission	13	4
28. Construction of a tire	12	4
29. Difference between sleeve and tappet valve	13	4
30. How a Stewart vacuum tank works	12	5
31. How the breaker and distributor work	12	5
32. The four-cycle principle	11	6
33. Pass "operator's license" questions in state traffic regulations	11	6
34. Why valve tappets must have clearance	9	8
35. Types of rear axle	9	8

Additional Units Suggested

36. Chief causes for accidents among drivers.
37. Chief points to consider in purchasing a family car.
38. Chief points in care of family car, including upkeep, operation, and cleaning.

ARCHITECT'S DRAWING, TECHNICAL HIGH SCHOOL, OMAHA, NEBRASKA

PROBLEMS AND PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

BUILDING A FLAT-BOTTOM BOAT

W. A. De Vette, Erie, Pennsylvania

(See Supplement No. 176)

Every woodworking instructor in schools located near lakes or streams is at some time or other confronted with the question, "May I build a boat?"

The answer to this question depends to a large extent upon the attitude of the instructor toward boating and water sports and to some extent on the mistaken conception of the equipment required to build a boat. This article will show that nothing beyond a very meager equipment is necessary, while all the materials are readily obtainable at any lumber yard and hardware store.

A flat-bottom boat, strengthened for an outboard motor by a double transom and which will give 12 to 15 years of service, is not too great an undertaking for two advanced boys.

The list of necessary material follows:

Bill of Material

2 pc.	1 in. x 10	in. x 16	ft.	Cypress	Sides (Lower Half)
2 pc.	1 in. x 8	in. x 16	ft.	Cypress	Sides (Upper Half)
2 pc.	1 in. x 12	in. x 4	ft.	Cypress	Rowing Seats
1 pc.	1 in. x 9	in. x 12	ft.	Cypress	Bow and Stern Seats
1 pc.	1 in. x 10	in. x 9	ft.	Cypress	Transom
125 lin. ft.	1 in. x 4	in.		Cypress	Bottom
1 pc.	1 in. x 4	in. x 16	ft.	Cypress	Keel
1 pc.	1 in. x 5	in. x 6	ft.	Cypress	Skeg
40 lin. ft.	1 in. x 1½	in.		Cypress	Ribs and Cleats
2 pc.	1 in. x 3	in. x 16	ft.	Cypress	Gunwhales
1 pc.	4 in. x 4½	in. x 2½	ft.	Hardwood	Bow Piece

½ gr. 1½ No. 10 f.h.b. Wood Screws
½ gr. 2 No. 10 f.h.b. Wood Screws
1 doz. 3 No. 10 f.h.b. Wood Screws
4 pc. 2 x 3 x ⅛ in. x 1 in. Strap Iron Angle Irons
3 lbs. 12d Coated Nails
2 lbs. Calking Cotton
1 Screw Eye for Painter Ring
4 lbs. White Lead
1½ or 2 gal. Marine Paint
2 pr. galvanized iron row locks
2 pr. 6½- or 7-ft. oars

Commence the actual construction of the boat by making the bow piece. This may be made of any available piece of hard wood as long as it is sound.

The next parts to be made will be the sides. The joints should be matched closely and then the upper parts clamped together while the curve is sawed out and planed on the upper edge. The lower edge of the lower board need not be touched at this time.

The piece to be made next is the transom which has been designed especially to carry an outboard motor and is therefore made double thickness with the grain in opposite directions. The two faces to be placed together must be given a heavy coat of white lead and the edges of the boards be calked against leakage. Next comes the temporary frame to be placed in the middle for the purpose of holding the sides to proper shape. This may be made of any available lumber and knocked out later.

Now the work of putting the boat together may be begun. The shape of the remaining pieces depends on the assembly and they are therefore omitted from the details.

Figure 1 shows the first step, that of assembling the bow piece and lower parts of the sides. Both surfaces coming together must be painted with white lead before the pieces are finally screwed in place.

The next pieces to be added are the upper parts of the sides. This is shown in Figure 2. This time the joints along the sides must be painted with white lead and lined with a strip of calking cotton before being clamped together. The location of the ribs given at dimensions A, B, and C are to be taken along the side before bending. The ribs are to be fastened with 1½-in. No. 10 f.h.b. wood screws, one being placed closely on each side of the joint as indicated. The ribs at the forward edge of the seats and the intermediate ribs are to be put in later.

That part of boat building which seems difficult to the uninitiated comes next; that is, the operation of bending the sides to the proper position and putting in the transom.

Scribe a line on the inner face of both sides 8 ft. 9 in. from the bow end and nail the temporary frame to one of them with two finishing nails, allowing the heads to stick out so they may be withdrawn. A block similar to those shown under the clamps in Figure 3 must now be nailed to each corner to facilitate clamping.

Now, while one person grasps the sides at the ends and bends them together, another nails the remaining side of the temporary frame in place and puts a bar clamp over and under the ends, as shown in Figure 3. The transom must now be inserted and the sides drawn up by means of the bar clamps. The angle at which the edges of the transom must be cut may now be determined and marked. The transom must then be taken out, planed to shape, the edges painted with white lead and lined with calking cotton. Paint the sides where they meet the transom, insert it and draw the sides tight with the bar clamps. Put in two nails to prevent slipping and put in the screws. Drawing the sides together in this way will give the desired shape for the bottom.

The two bottom edges must now be planed down along the outside till a flat surface is obtained against which the bottom boards may be nailed.

By a little judicious planning, the boards for the bottom may be cut with very little scrap. Cut all of the boards before commencing the work of nailing them in place and number them consecutively from bow to stern on the outside face. Plane each joint, and with a single cut make a very

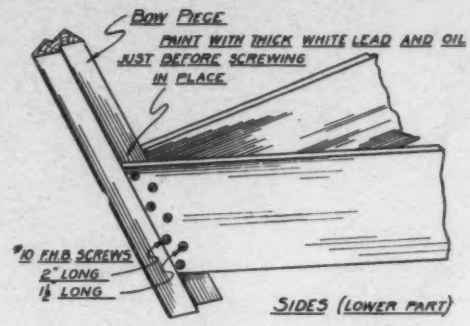


FIGURE 1

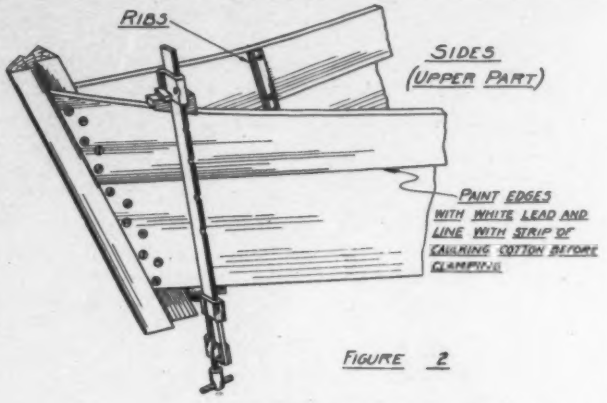


FIGURE 2

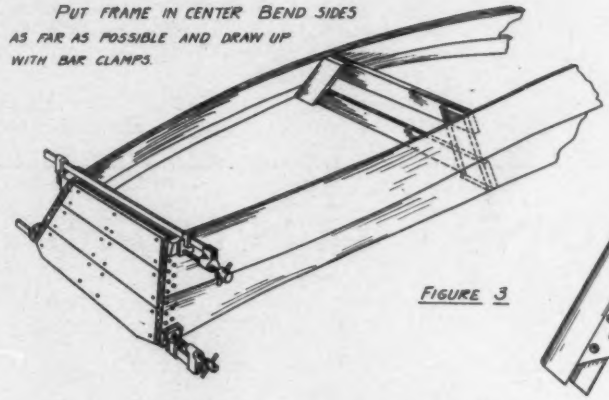


FIGURE 3

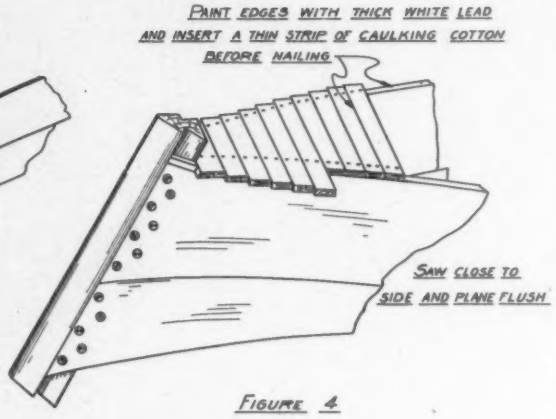

PAINT EDGES WITH THICK WHITE LEAD AND INSERT A THIN STRIP OF CAULKING COTTON BEFORE NAILING
SAW CLOSE TO SIDE AND PLANE FLUSH

FIGURE 4

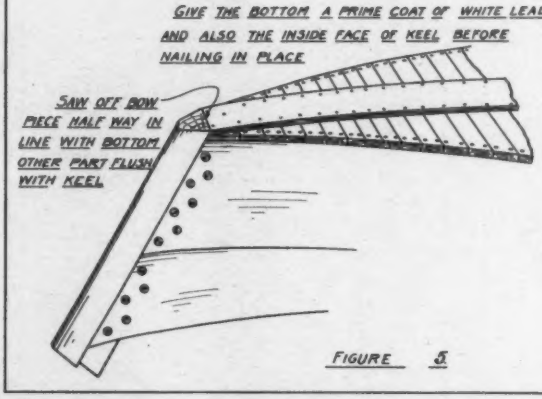

GIVE THE BOTTOM A PRIME COAT OF WHITE LEAD AND ALSO THE INSIDE FACE OF KEEL BEFORE NAILING IN PLACE
SAW OFF BOW PIECE HALF WAY IN LINE WITH BOTTOM, OTHER PART FLUSH WITH KEEL

FIGURE 5

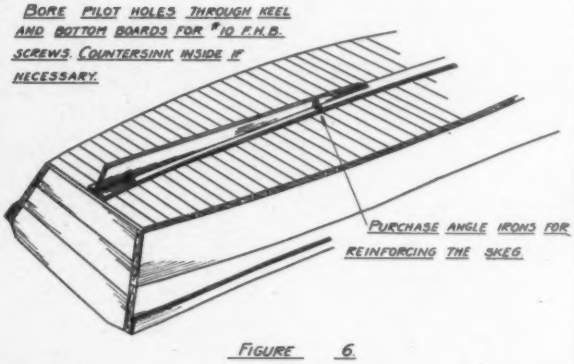

BORE PILOT HOLES THROUGH KEEL AND BOTTOM BOARDS FOR #10 F.H.B. SCREWS. COUNTERSINK INSIDE IF NECESSARY.
PURCHASE ANGLE IRONS FOR REINFORCING THE SKEG

FIGURE 6

slight chamfer along each outside edge to facilitate calking. Paint both faces of each joint with white lead and lay a thin strip of calking cotton along the bottom before placing each board and nailing it. (See Fig. 4.) Flat-head bright screws may be used for fastening the bottom boards if thought desirable, or one screw may be placed in the middle of each board with a nail on each side. The extending ends may now be sawed off and planed flush. It will be well to use an old plane for this purpose. The joint between each two bottom boards must now be calked with cotton and white lead.

Figure 5 illustrates the next operation — cutting half of the bow piece, or stern, flush with the bottom boards, painting and placing the keel and sawing the remainder of the bow piece flush with it. Each nail through the keel should be clinched on the inside to insure a good hold.

The skeg, which is put on next, must be cut to conform to the curvature of the keel and held firmly in place with long screws and with angle irons. The screws at the rear end must be pilot drilled from the outside and driven from the inside. The screws at the forward end may be driven from the outside.

Some prefer to leave off the skeg to reduce draught, but the improved rowing quality more than makes up for this when it is added.

The gunwhales are put on next, tapered at the bow, as shown in the plan view of the boat.

Next comes the fitting of the seats. These must be placed to suit the comfort of the owner. The remaining ribs and cleats may thus be located and screwed in place for the seats. The inside of the boat should be given two or three coats of a good grade of marine paint before the seats — also painted — are put in place. The seats should be fastened both to the cleats and to the sides, the latter being driven in from the outside. The frame can then be taken out. The row locks are put on last and may be of any style to suit the owner.

The outside and trim must now be given at least three and preferably four coats of marine paint.

The oars must be fitted in pairs, the pins on each being so placed that when they are put in the locks and held end to end there is a 2-in. gap between the handles.

The boat, when placed in the water, should be submerged for a few hours to allow the joints to swell shut.

HIGH POST, FOUR-POSTER BED

Franklin H. Gottshall, Director of Industrial Arts, Mount Berry College, Mt. Berry, Georgia

Although the bed, described in this article, is a high-poster, it is not too high to look well in a medium-size room. It is wide enough for two persons but it does not take up an excessive amount of space. The width, of course, can easily be varied.

The bed has no foot board. It is suggested that the student be allowed to design one if one is desired. The foot rail and head rail are mortised into, and fastened permanently to, the posts with glue and wooden pins as shown at A. They also come flush with the outside of the post. The side rails are necessarily removable, and are fastened with bed bolts as shown at B. They may be bought in any length at a hardware store. The holes can be covered with bed-bolt covers of dull brass. The design of one is shown in the illustration.

If the bed of the lathe is not long enough to turn the bed-posts to the full length, they may be turned up in two pieces and fastened together as shown in the illustration. The small finials at the top of the posts must be turned separately, since they are too delicate to be turned as a part of the post. Mahogany, maple, walnut, birch, or cherry are good woods to use in making this bed.

Box springs and a mattress should be used on this bed. Both may be bought in various sizes.

Bill of Material

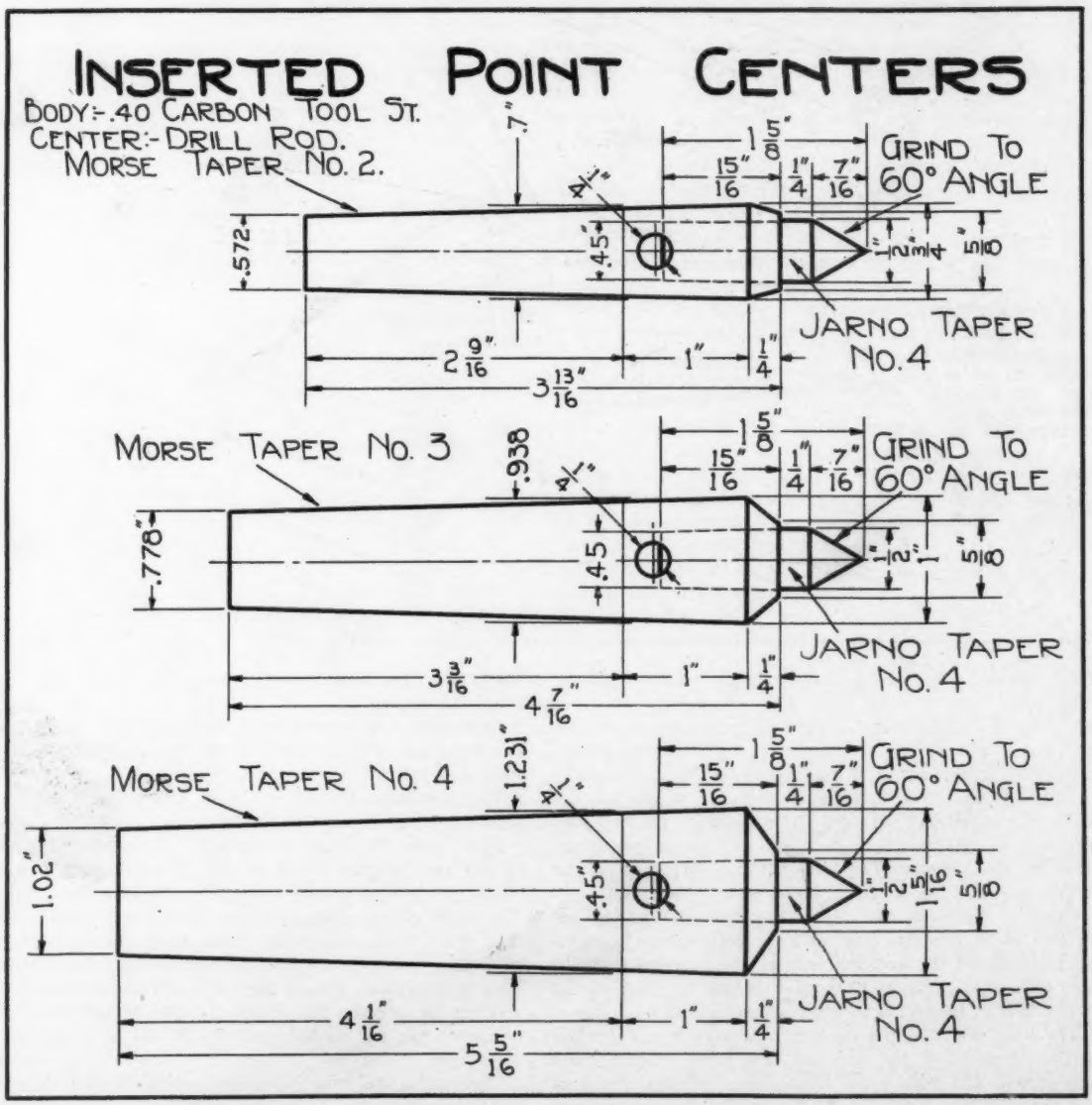
4 pc.	3¾ x 3¾ x 69⅜	Posts
4 pc.	1½ diam. x 5½	Finials
1 pc.	⅞ x 19 x 46	Head Board
2 pc.	2 x 3½ x 46	Head and Foot Rails
2 pc.	2 x 3½ x 76	Side Rails

INSERTED POINT LATHE CENTERS

W. P. Childs, South Pasadena, California

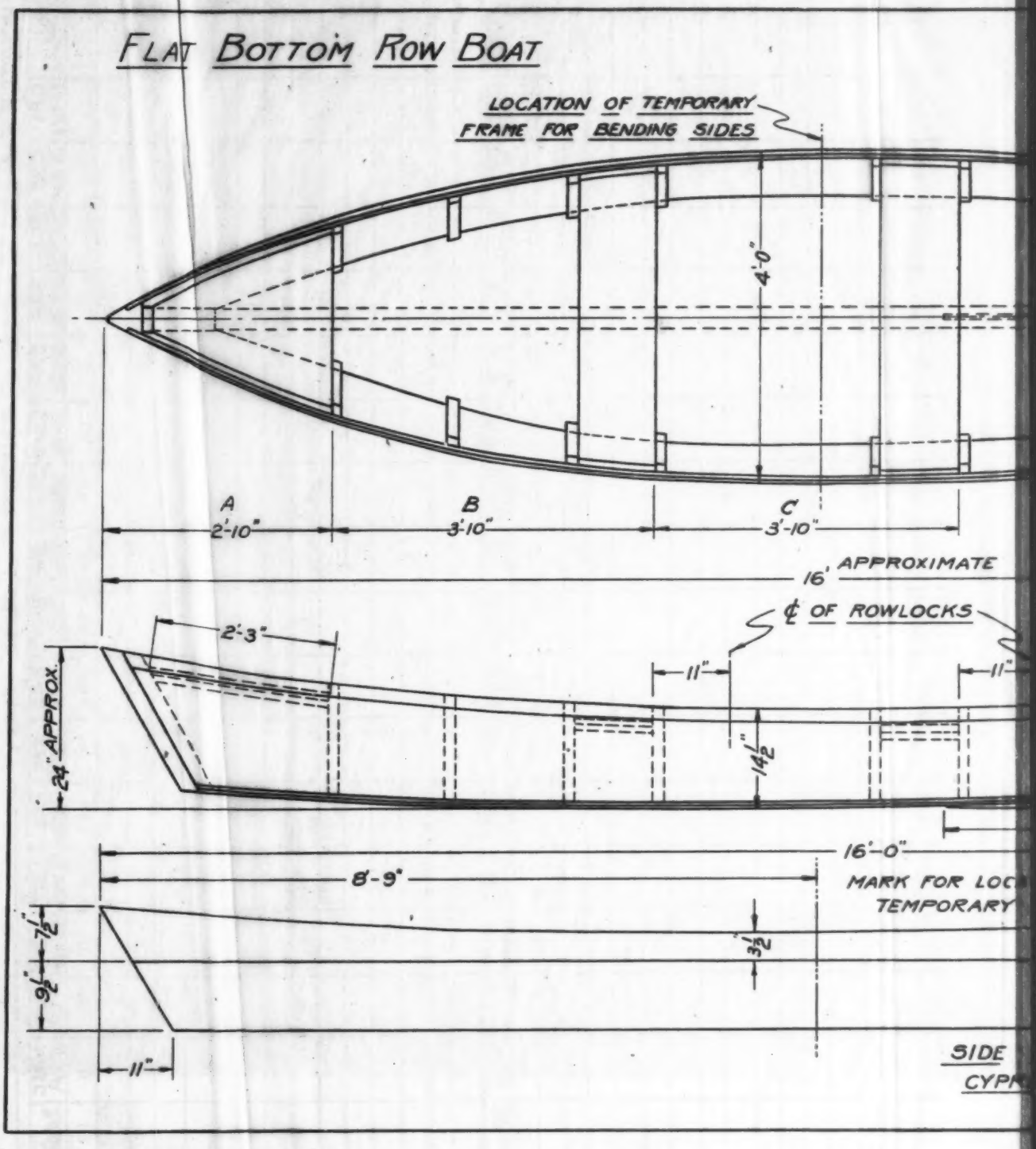
The centers shown in the accompanying illustration have been found very useful in our high-school machine shop. We also have found them a very good lathe project for beginning second-year students.

The bodies are turned up in pairs for convenience in machining. They, as well as the points, are finished entirely



TRACING SUPPLEMENT No. 176,
THE INDUSTRIAL-ARTS MAGAZINE,
MAY, 1930

FLAT BOTTOM ROW BOAT



Designed by W. A. DeVette, Erie, Pennsylvania

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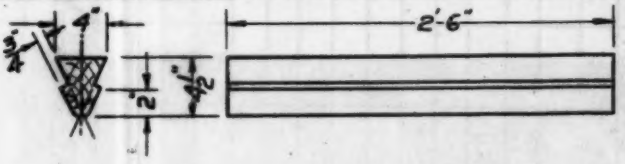
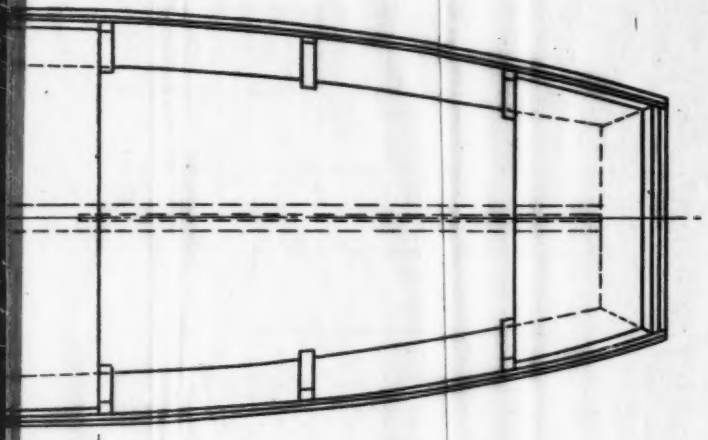
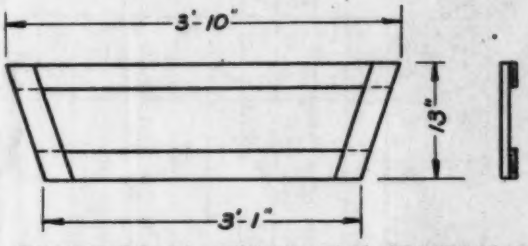
BOW PIECE
HARDWOOD

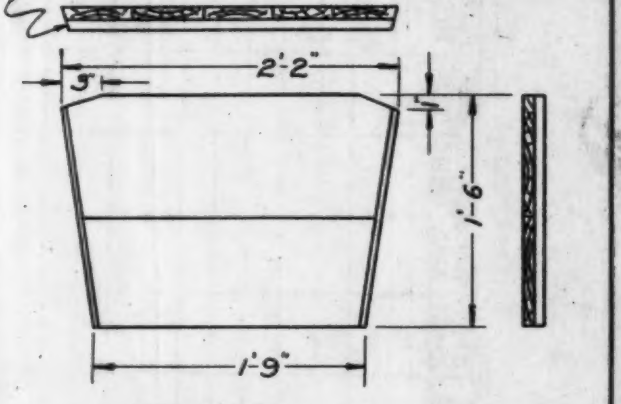




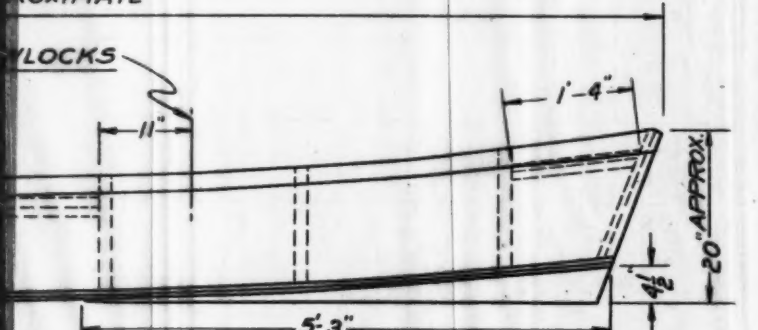


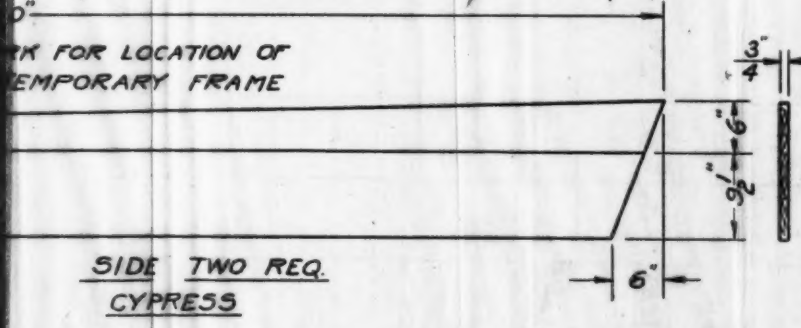
TEMPORARY FRAME FOR BENDING SIDES
USE ANY AVAILABLE LUMBER

THIS SLANT TO BE DETERMINED FROM SIDES WHEN DRAWN INTO POSITION



TRANSOM
MAKE OF TWO THICKNESSES OF 1" CYPRESS - GRAIN OPPOSITE DIRECTIONS



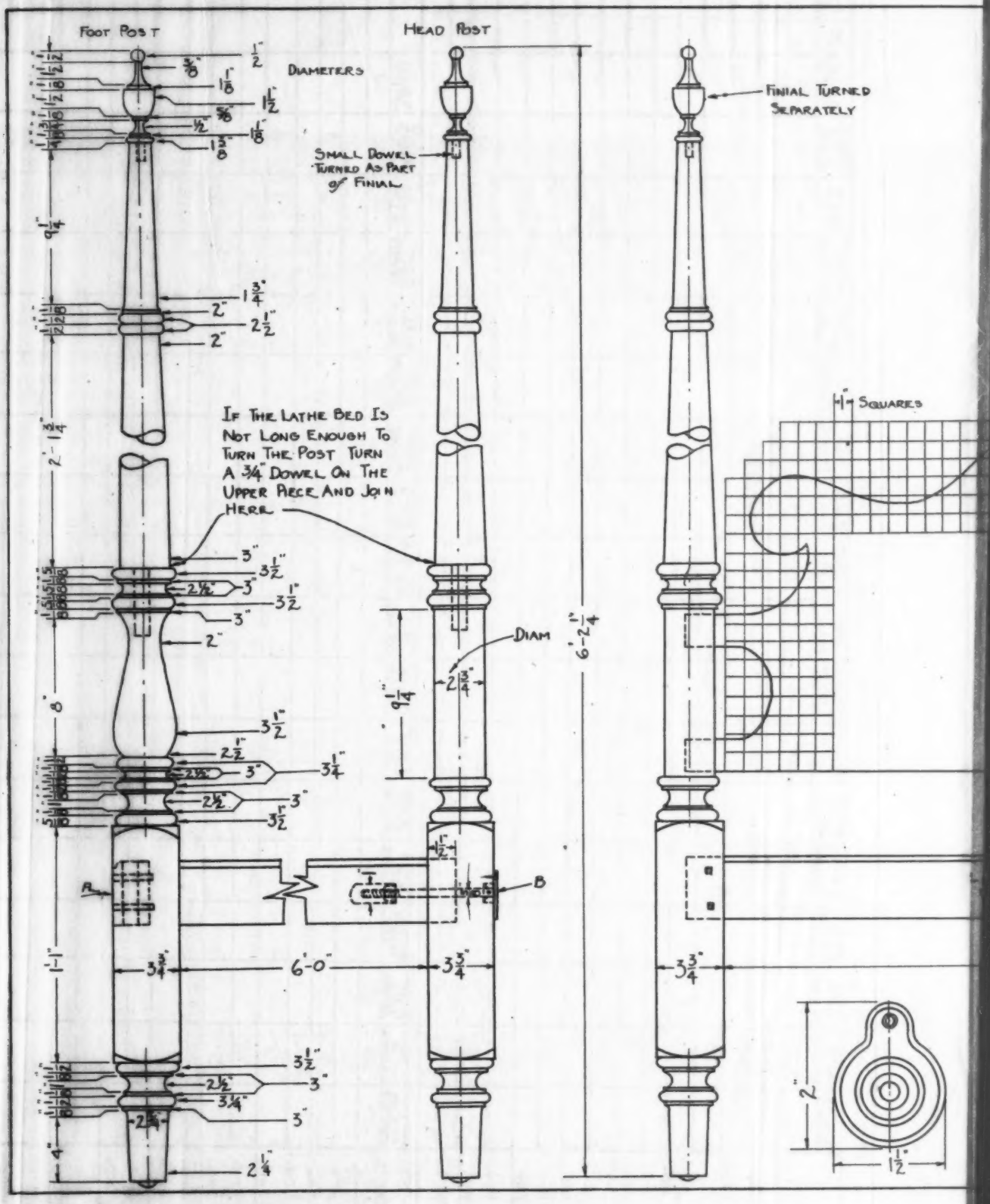


SIDE TWO REQ.
CYPRESS

FOR PARTS NOT DETAILED SEE BILL OF MATERIAL

For Description See Page 188, Industrial-Arts Magazine, May, 1930.

TRACING SUPPLEMENT No. 177,
THE INDUSTRIAL-ARTS MAGAZINE,
MAY, 1930



Designed by Franklin H. Gottshall, Mount Berry, Georgia

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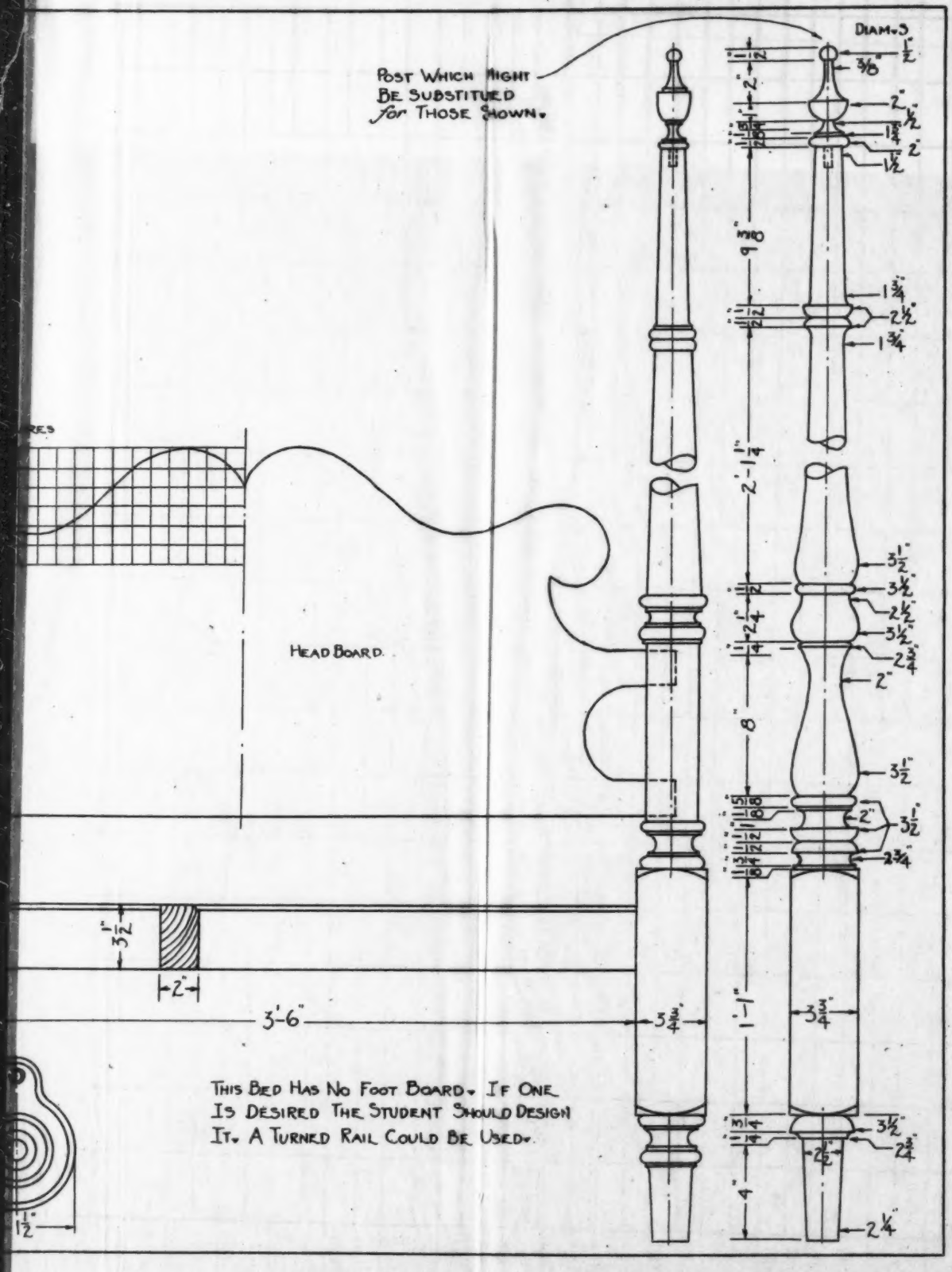

DIAM.-S
POST WHICH MIGHT BE SUBSTITUED FOR THOSE SHOWN.
HEAD BOARD.
3'-6"
THIS BED HAS NO FOOT BOARD. IF ONE IS DESIRED THE STUDENT SHOULD DESIGN IT. A TURNED RAIL COULD BE USED.

For Description See Page 190, Industrial-Arts Magazine, May, 1930

ADVERTISING PAGES REMOVED

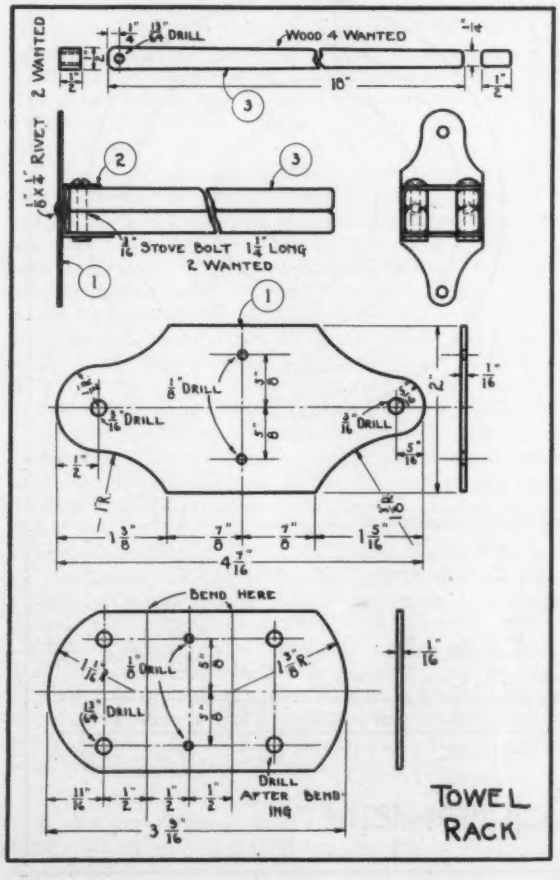
in the lathe as we do not have a grinder. The bodies are left soft, but the points are hardened, tempered and polished after turning. The bodies have Morse taper shanks to fit in the lathe, while Jarno tapers are used for the points. This is done in order that the student may become acquainted with the different kinds of tapers. The Brown and Sharpe taper is illustrated in making milling-machine arbors.

The actual machine work is started by cutting stock which is 1/16 in. to ⅛ in. larger in diameter and about ⅛ in. longer than the finished center. Thus for the No. 4 Morse taper, for instance, 1⅜-in. round steel is used. The length of the piece is ¼ in. longer than twice the length of the finished body. After the piece is cut to the required length, it is centered, after which it is turned down to the proper taper. This may be done on a lathe with a taper attachment or, on one with a compound rest only, or by setting over the tailstock. Care should be taken to have the tool bit ground correctly so as to insure a smooth finishing cut. After the tapers have been properly turned, the tapered hole for the Jarno taper should be made. This is done by chucking the machined shank in the headstock live center, placing a drill in the tailstock, and drilling a hole of the proper size. A taper reamer is then used to finish the job. After the hole has been reamed, the outer end is chamfered as shown. The drift hole is next drilled, and the inserted center is then turned up in a similar manner.

A TOWEL RACK

W. R. Challoner, Appleton, Wisconsin

The towel rack illustrated herewith furnishes a job which gives the beginner a good opportunity to learn how to use the combination square and dividers in laying out work, how to perform a few simple operations on the drill press, how to use a hack saw on thin material, how to do a simple riveting and assembling job, and how to work from a drawing.



If a part is spoiled in the layout or the making, it can be replaced without much additional cost.

The arms are made of wood, and the bracket of metal. This ties the woodworking and metal-working experiences together.

The metal parts should be lacquered.

The rack when complete makes a useful article for the home, and the cost is exceedingly small.

PRINTING-SCHOOL GRADUATES

Leroy Brewington, Senior High School, Pittsburg, Kansas

Do young men who take printing courses in schools of printing enter the industry? The answer to this question has been one of doubt to both the schools and the printing trade during the past few years, because no definite information has been available.

A report compiled from a survey conducted by Fred J. Hartman, director, department of education, United Typothetae of America, has recently been printed in tabulated form. This is the first census of its kind. It includes 113 printing schools located in the United States and Canada, and is for the school year 1927–28.

The plant or shop schools head the list with a 100 per cent of their graduates entering the trade. The number of schools who reported were four, having a total of 79 graduates. This percentage is not at all astounding as the number of shop schools is limited to a very few. Each student entering this type of school has had the privilege of testing himself in some printshop to determine if he possessed the talent required of a printer, before definitely deciding to enter the trade.

The 39 trade or vocational schools reported 90 per cent, or 1,590 out of 1,751, of their graduates who entered the trade. The reason given for the comparatively low percentage, is that the majority of young men enter the vocational schools without any previous experience, or without even a slight conception of what the vocation consists. Unlike the shop-school student, none of the vocational-school students are sure that they have the necessary qualifications before they enter school. Some remain in an unsettled condition all through the course. This type of school also gets a few students who are attending just to be occupied with the study of some vocation, until they have definitely decided what trade or profession they want to follow.

Of four colleges who reported, 31, or 81 per cent of the 38 graduates entered the industry. Until the past year some few colleges granted 32-hour printing majors plus a number of elective hours in printshop practice, thereby qualifying to a fair degree the college graduate for a commercial position. During the past few months, however, the colleges offering these industrial-education courses are decreasing the number of shop practice subjects for more theorizing ones. This change is largely due to the return of the so-called high academic standards. This leaves only what is known as a special or vocational course to those seeking a thorough printing education in the colleges.

Eight special schools reported 82 out of 153 graduates who entered the industry. For some reason 47 per cent failed to enter the trade. These special schools are composed largely of such types as those who guarantee to train one in a few weeks' time in any phase of printing, especially linotype operating. These special schools as a rule, are privately owned. The good they do is questionable as it is impossible to train men for the printing trade in a period of a few weeks. It takes several years of study and practice for a student to establish himself in the fundamentals of the printing art. Too many schools at the present time are turning out incompetent workers, commonly known to the trade as "barnstormers."

The seven junior high schools had 114 printing graduates of which 36, or 33 per cent, entered the industry. The 33 senior high schools reported 173, or 29 per cent of their 586 printing graduates who entered the industry. The percentages in both these types of schools are very low and close with only a 4-per-cent difference, the junior-senior group rating the

highest. Some printing teachers have advanced theories for these low percentages in these two types. The more common are those of unsettled mental condition, curiosity and credit seekers, misfits, negative attitudes, and those who seek printing for the appreciative and educational values.

The junior high schools reported 572 graduates of which 90 entered the industry. These 16 per cent were from 16 junior high schools. Mentally and physically immature, the junior-high-school graduate should not be permitted to enter the industry except for the one possible reason of self-maintenance.

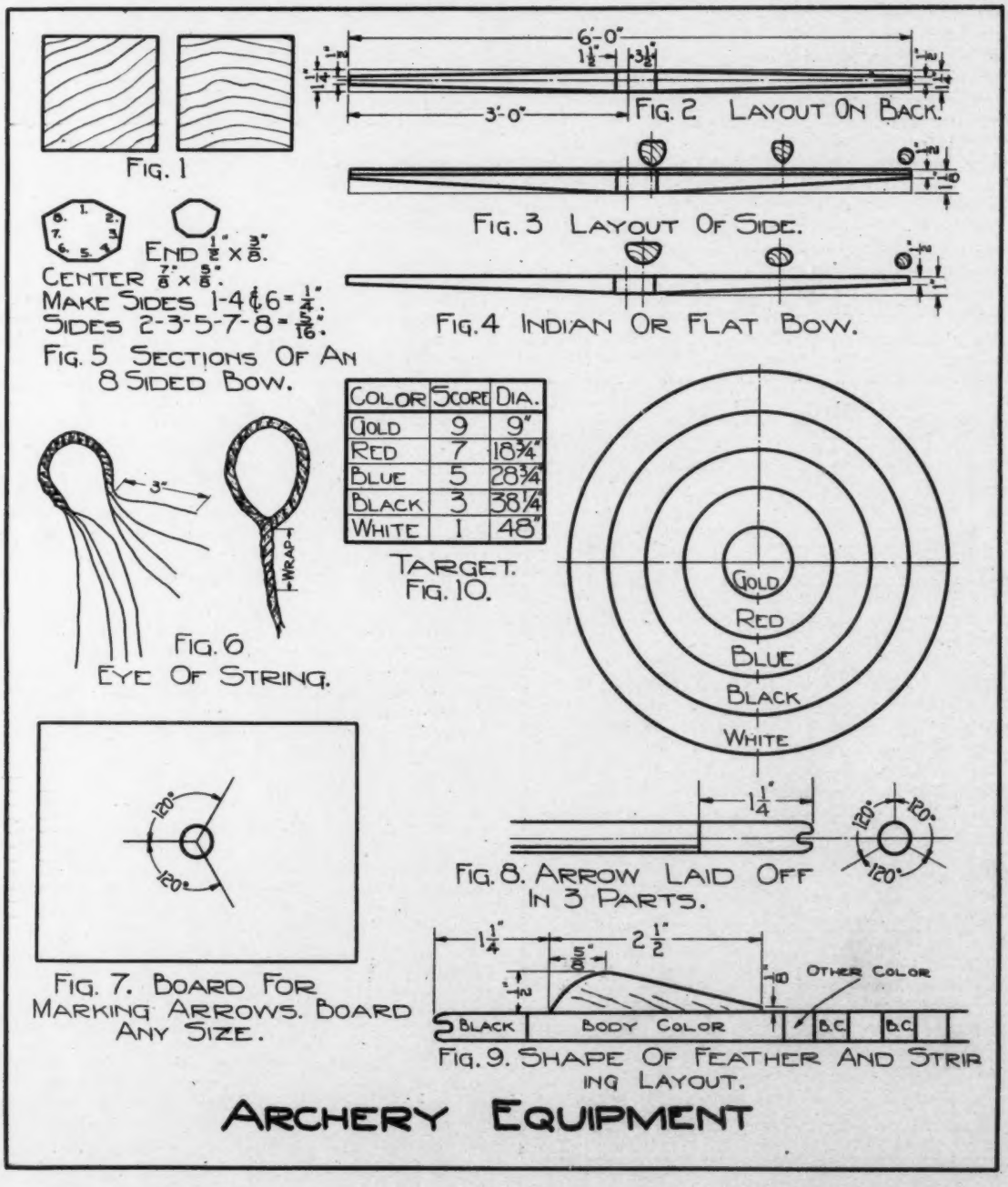
Only two elementary schools reported 75 graduates, but they did not have any who entered the industry, and from a logical standpoint of reasoning, should not have.

From a summary of this survey there are a few facts worthy of consideration. It is evident the schools have taken over the responsibility of training the trade apprentices, whereas the shops formerly trained their own in a crude and slow method. Practically two thirds of the printing-school graduates enter the industry. There are a few, however, who do not stay permanently, but later go to other occupations. The special schools have the greatest number of failures, probably because of the "factory" method of training men in too short a period of time. The primary aims of the colleges, senior and junior high schools in teaching printing as a part of their curricula are the correlative, manual-training, and appreciative values.

ARCHERY EQUIPMENT

James A. Hoskins, Director of Industrial Arts, Fort Collins, Colorado

Archery equipment can be made in any shop, large or small. Few tools are needed, as best results are obtained by handwork. The interest created by the making of bows and arrows does not stop when the project is finished, for these bows and arrows should be tested before a grade is given. Not only is there the desire to have the first arrow go whizzing through



COLOR	SCORE	DIA.
GOLD	9	9"
RED	7	18¾"
BLUE	5	28¾"
BLACK	3	38¼"
WHITE	1	48"

the air, but skill must be attained to hit the target.

In the author's classes where this project has been used, great interest has been manifested. We now have three targets used for testing the bows and arrows made in the shop. These targets are also used by the physical-training department in the archery classes.

The equipment for archery may be divided into four divisions, each of which will be taken up separately:

The Bow

The bow should be made in three sizes:

1. 5 ft. 3 in. for small boys or girls
2. 5 ft. 6 in. for older girls
3. 6 ft. for larger boys or men

All may vary as to weight or pull to suit the strength of the user. The length of the bow is determined by the height of the person using it.

The woods best suited for bows are: yew, lemonwood, Osage orange, walnut, cedar, hickory, and ash. Walnut and cedar are not so good used alone, but should be backed with hickory. In selecting wood for a bow the end grain should look like Figure 1. Natural dried woods must be used since kiln-dried woods are too brittle.

For high-school boys the lemonwood bow is best, but these staves are hard to get in some parts of the country. Walnut or cedar backed with hickory, or hickory alone may be used. When used alone, however, hickory has a tendency to hold the shape of the bow. To make a backed bow, take a piece of walnut or cedar about 1 in. by 1⅜ in. by 6 ft. and a piece of hickory ¼ by 1⅜ in. by 6 ft. These should be well jointed, warmed, and coated with hot cabinetmakers' glue. Wrap with a long rubber strip about an inch wide cut from an old inner tube. If this rubber strip is wrapped tight and close together like a bandage, it will insure good contact all along between the backing and the main stave. When thoroughly dry the back should be planed smooth and laid out as shown in Figure 2, laying out center line first, next the handle, then the width of the ends. Connect the ends with the handle and plane to these lines. Round the sections as shown in Figure 3. This shape is known as an English bow and is most used. The Indian bow is flat and must be wider to have the same pull. An eight-sided bow is shown in Figure 5. This is a good shape for short boys.

When the stave is shaped the tips should be put on. These may be purchased at very reasonable prices, or they may be made from cow horns well polished with emery paper. The one thing to remember is to have the tip light in weight. If the horn is used, cut off about 2 in. and drill a 7/16-in. hole into the center about ¾ in. deep. Into this hole insert a piece of wood to hold the tip while shaping with a wood file, and when the tip is shaped glue on the bow stave which should be cut to fit. With a small round file, make the nock around the tip, so the string will fit in. The handle of the bow must be stiff enough when pulled to take the shape of Figure 12.

The bow should now be strung to see how it draws. Place a stick about 20 in. long in the center of the handle and draw the string over the other end of the stick. Set the bow on its back and step back and see if the bow has an even bend in each end. If it does not, take a scraper and scrape in the straight places until it has an even bend. Unstring the bow and sandpaper. The bow is then ready to be finished. Clear lacquer makes a good finish; or a rubbed finish, using shellac and oil, may be used.

After the bow is finished, the handle is either wrapped with chalk line or covered with leather or velvet. (See Fig. 11.) If chalk line is used, it makes a better-looking job to use two or three colors wrapping them side by side. If leather or velvet is used, glue them to the handle and with another color, preferably colored calfskin, bind each end.

The String

Of all parts of archery tackle that is offered for sale, the string is the poorest. A good string should be small, smooth, not too stiff, yet very strong. Linen thread, well waxed, meets these requirements best. In making a string, place two nails about a foot farther apart then the length of the bow. Around these wind eight or nine strands of six-cord Barbour's linen or harness thread. This will make a string strong enough for a bow of 40 or 45 pounds. For light bows, use less linen threads, depending upon the weight of the bow. Remove the thread from the nails, tie a slip knot in one end and replace it on the nail. Cut the other end so the strands will be single. Wax each strand with beeswax, if white thread is used, or beeswax 3 parts and harnessmakers' wax 1 part melted together and cooled, if black thread is used. Take an extra piece of thread about five feet long and wax it also. This is to wrap the ends and eye of the string. Take all of the strands and draw them through the hands to assure even waxing. We are now ready to wrap the ends. Take a spring like a screen-door spring, two common nails bent in the form of hooks, and a drill. Clamp the drill in a vise so the handle will turn. Have one hook inserted in the drill, the other fasten to the spring. Stretch out the string and tie to these hooks.

About 3 in. from the end of the string at the drill end start wrapping. To do this, lay the extra piece of waxed string along the strands and wrap over it, turn the handle of the drill slowly, holding the string tight. When enough of the string is wrapped to form an eye big enough to slip over the end of the bow, tie the string. We are now ready to splice the eye in. Cut the string near the knot at the drill end thus leaving about 3 in. of string in loose strands. Take each of these and twist them around a strand below the wrapped part. Hook the eye over the hook in the drill and wrap this splice with the string as before. (See Fig. 6.) Next, make an eye in the other end of the string, so that the string is about 3 in. shorter than the bow. Be sure that the string is not twisted when you take the measurement. When this eye is finished, wrap a space in the middle of the string about 5 in. long with fine linen thread, such as is used for sewing on buttons.

If the string is not short enough, it may be twisted a little. This will shorten it to the correct length.

To string the bow, slip one eye over the bow. Let the string down enough so the other eye will go over the other end. Hook the lower eye into the nock. Place the lower horn of the bow in the hollow of the right foot. Grasp the handle in the right hand, and with the thumb and forefinger of the left hand slip the string into the upper nock and at the same time push out on upper limb of the bow with the palm of the hand. Practice will give ease in stringing a bow.

The Arrows

After the bow is completed the arrow should be made. For target arrows 5/16-in. birch dowels are very satisfactory, as they do not break so easily as pine arrows and are very little heavier. When the dowels are received it is best to test them for cross grain by bending them. After the shafts are selected the points should be put on. A bullet point 30 caliber makes the best point for target work. About three fourths of an inch from the end of the shaft cut a ring with a sharp knife and remove enough wood with the knife to make a tight fit into the shell. The point of the shaft should be pointed a little to allow it to go into the point of the shell. The points should be driven on the shaft with a mallet or block of wood. They may be fastened in place by taking a sharp center punch and making a dent near the upper end of the point. After the shafts are pointed they should be laid on the bench with the points against something straight and marked for length with a pencil and square according to the following table:

24 in. long for 5 ft. 3 in. bows
25 in. long for 5 ft. 6 in. bows
28 in. long for 6 ft. bows

The arrows should be sanded lengthwise with fine sandpaper so they will take a good finish. The next step is to cut the nock. It should be cut about 3/16 in. deep and about the same in width. There are several ways of doing this, but we find the following methods the best. Put the shaft in a vise with a piece of cardboard around it and cut two saw

kerfs with a backsaw making the nock 3/16 in. wide. If any wood is left between the saw kerfs it should be removed with the saw. The bottom is now rounded and smoothed with a hot 16d nail, being careful not to let the wood blaze or get too hot. This will give a smooth, hardened bottom to the nock. The other method is to use a small round file to round the bottom. In either case, the outside should be rounded with a sharp knife and sandpaper so the arrow will leave the fingers easily.

The fletching or putting on of the feathers is considered by many to be the most difficult task in making archery equipment, but with patience one should have no trouble if the following directions are followed carefully. First prepare a board as shown in Figure 7. The hole should be 5/16 in. in diameter. Insert each arrow, being careful that the nock is horizontal, then mark on the shaft where each of the three lines come. Now take each shaft and lay it on a table, and with a yardstick or other rule measure down 1¼ in. from the nock end, and from this mark draw three lines lengthwise along the rule or yardstick at the points marked from the board. The arrow should look as shown in Figure 8, lines being drawn at 120 deg. as shown in the end view.

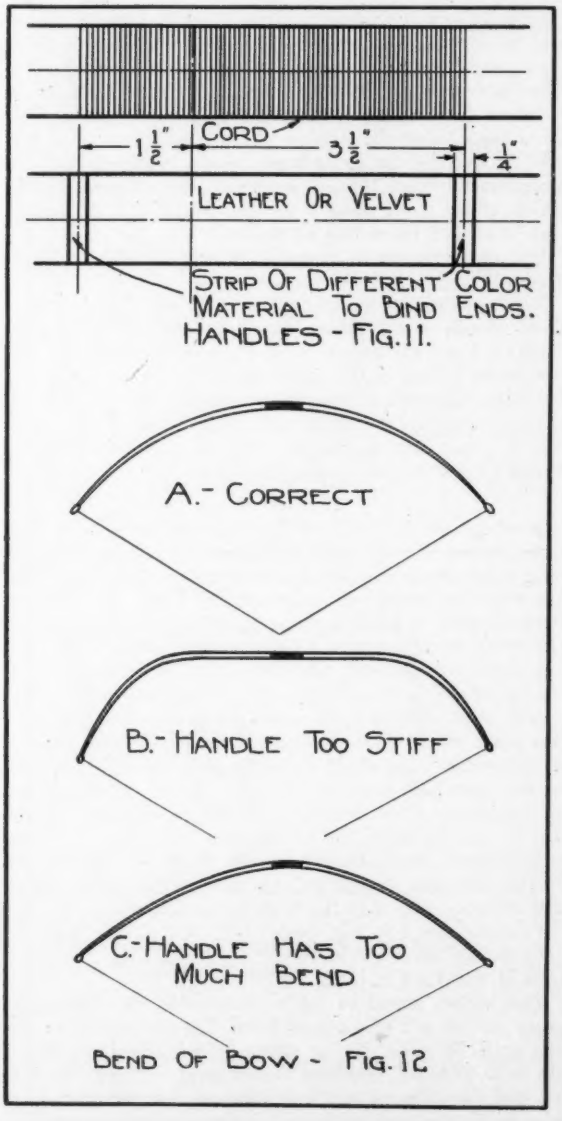
The best feathers to use are the large wing feathers from a turkey. If white feathers can be had, it makes a very pretty arrow to have the cock feather, or the one at right angles to the nock white and the other two black. If white feathers are used, they may be dyed with any standard dye. Colored feathers may then be substituted for the black. Feathers take the dye well, but must be thoroughly dried before they are used. To strip the vane of the feather from the quill, take the quill in one hand, the vane in the other at the outer end of the feather, and pull the vane out and down. This will remove the vane without any of the pith of the quill sticking to it.

The best glues for putting on feathers are hot cabinetmakers' glue, a little thinner than for wood, or DuPont's household cement. If glue is used the feathers must be warm and steamed. To do this, cut the feathers into 2½-in. lengths after they have been stripped from the quill. It is best to have the feathers from the same side of the turkey in a batch of arrows, as this will simplify the process by having feathers from the same side on each arrow, then they will curve the same and are much easier to put on. Next, take a heavy piece of carpet or a wool pad and dip it into boiling water. Lift it out and drain, lay it in the sink and place the feathers on half of it, and fold the other half over and cover it with a board and weight and leave for a few minutes so the feathers will have time to steam. Before they cool, remove the feathers a few at a time, and with a match or small blade of a knife, apply hot glue to the quill side and quickly put this on one of the lines on the shaft of the arrow with the feathers pointing toward the nock. As soon as the three feathers are on, place the arrow on the table with the feathers hanging over the edge.

If cement is used proceed as above, except do not steam the feathers. Apply the cement to the feather and place them on arrow, fastening them with three or four pins. After the cement is dry the pins are removed. This method is most convenient where an electric glue pot is not accessible. In the author's experience, either method is good.

When the feathers are dry they should be trimmed. The form shown in Figure 9 is best for target shooting. A cardboard or tin pattern should be made so all feathers will be cut alike.

The arrows are now ready to be painted. Lacquer or enamel is best, in bright and contrasting colors. Between the feathers and about a quarter of an inch at each end, the feathers should be painted; first, with a solid color known as the main color. To the point end there is usually two stripes about ⅜ in. wide and about ⅜ in. apart, as shown in Figure 9. Between these stripes some contrasting color is used. Several may be used if desired and interesting harmonies worked out. A set of arrows consists of six arrows and these should all be alike. The nock is painted black. The paint around the feathers protects the glue from moisture and adds to the beauty of the arrow. When the color stripes are dry the entire arrow should be given a coat or two of clear lacquer or one coat of shellac and a coat of spar varnish.



The Target

After you have accustomed yourself to shooting across the lot, you will want to do some target shooting. A target should be about 4 ft. in diameter and can be made at little expense. A canvas face painted as shown in Figure 10, put over five bales of straw serves very well and is easy on arrows. If you wish a target that can be moved easily, take straw or excelsior and make it into a rope about 4 in. in diameter. Roll this into a flat roll like a mat the shape of the target. Tie each roll firmly before rolling again. When this is a little over four feet in diameter put the canvas face over it and sew with heavy cord. This target may be fastened or tied to an easel making it easy to move. The easel should be made of iron rods or of 1½-in. pine strips. In no case should a target be made of beaver board or similar materials, as it will ruin the arrows.

Archery equipment made as described will give a maximum amount of pleasure and recreation in limited space with minimum cost.

MAKING A BOWSTRING

Geo. C. Decker, Fairview High School, Dayton, Ohio

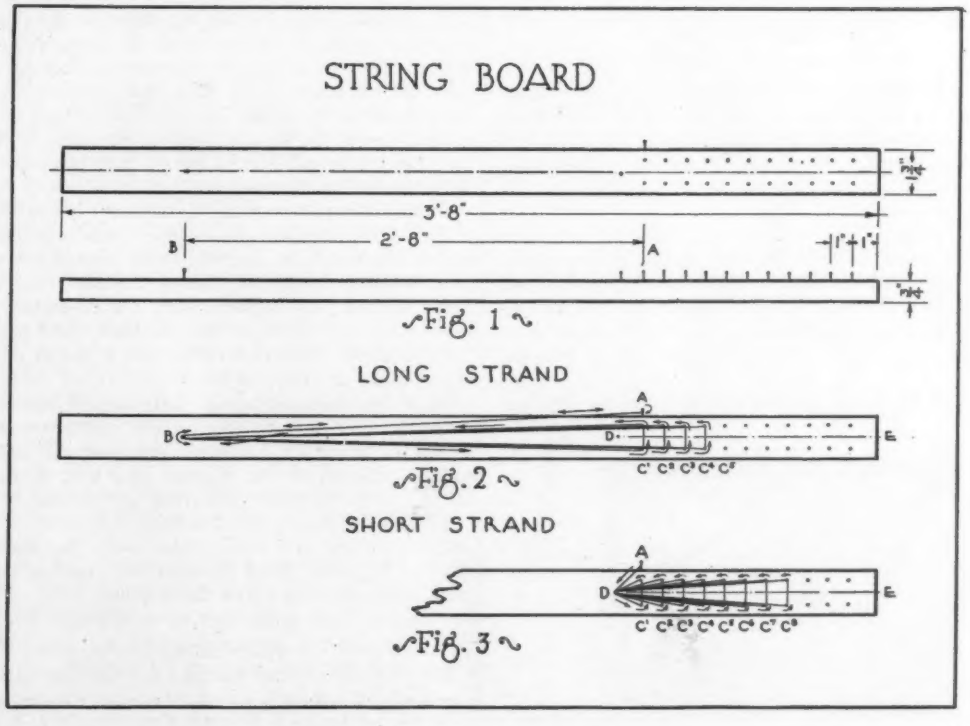
***Editor's Note*: The article on the making of bowstrings presented herewith is quite timely. It is an excerpt from a book entitled *Bows and Arrows for Boys*, by Geo. C. Decker, which has just appeared.**

The finest material to be had today for bowstrings is Barbour's No. 3, Best Irish Flax thread, which is very strong and will actually stand a test of 1 pound pull to a single strand. Barbour's thread can be obtained from any shoemaker or leather worker in the form of balls or spools. Each ball will contain enough thread for about five bowstrings. To aid in quickly making a bowstring, a simple board with nails or small screws in it is a distinct advantage in order to get the proper taper for the loop at the end. The other end of the string is plain and tied securely with a timber hitch.

For the string board, select a piece of any material about ¾ inch thick, 1¾ inches wide, and 3 feet 8 inches long. Lay off 1-inch spaces across the face of the board at one end; place parallel rows of 1-inch brads or round-head screws on these lines, ½ inch on either side of the center line. (See Fig. 1.) Then there must be a brad, or screw, at point A, on the edge of the board which is the beginning point in laying out of the various strands that make up the completed string. At point B, place another brad, or screw— this point is variable and depends upon the length of the bowstring to be made. The dimension 2 feet 8 inches, as given in Figure 1, is about right for a 5-foot bow. Usually, about 6 or 7 inches of the original thread length is taken up later in twisting and the tying of the timber hitch. A brad, or screw, is placed at point D also, and will be used in the making of reënforcement strands. All of these brads, or screws, should project from the board about ½ in. They form points about which to wind the thread in laying out the various parts of the bowstring. This device does not take long to make and will save much time in the making of future bowstrings. An archer usually carries one or more extra strings at all times for his bow. When one string becomes worn or shows signs of weakening, it should be replaced with a new one.

Now proceed to the actual making of the bowstring. First, lay the string board on a bench, or clamp it in a vise, with the nail or screw heads up. Next, find the end of the thread on the *inside* of the ball of thread and tie it to the projection at point A. (Put the ball of thread in a small box and pull the end you work with through a small hole in the lid. This will keep the thread from becoming tangled as you lay out the different strands of the bowstring.) Bring the thread from point A to B, passing around B, then to C^1, around both nails at this point and back to B (keeping outside of B), then to A, around A and retrace this same route but lengthening the process each turn to nails C^2, C^3, C^4, C^5. End up with the thread at point A after lapping each set of two nails to C^5. (See Fig. 2.) Reasoning out just what has been done makes the process seem extremely simple. The distance from A to B is one half the total length of the bowstring, and the distance from B to C^1, where the taper begins, is the other half of the total length plus enough allowance for twisting (which comes later) and the timber hitch.

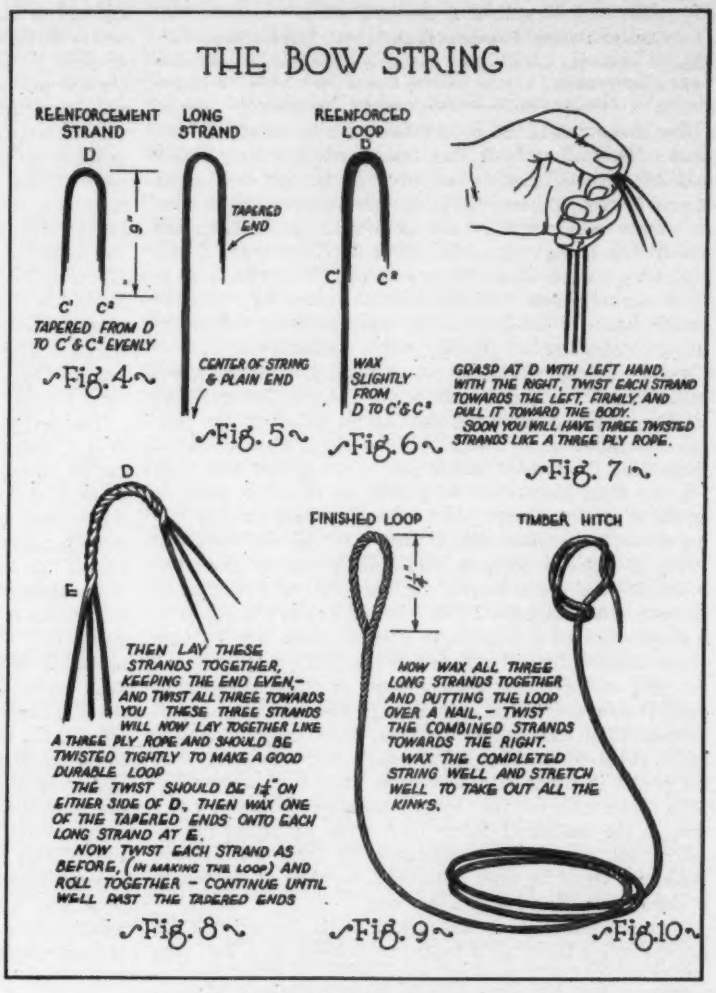
The next step is to cut the thread on the center line from D to E which gives ten thread ends of varying lengths. Then cut all threads at point A. Now pick up all the threads at point B and stroke them together toward each end from B. This makes one strand of ten threads, with one end tapered, the other plain. It is now necessary to make two more strands exactly like this. Lay each strand, as it is completed, by itself. When these three strands are completed, make short, tapered strands for reënforcement at the loop. (See Fig. 3.) To make these short strands, tie the thread as before at point A; go around D this time and around the first set of points at C^1, back around D (do not return to A this time), and retrace the same route, lengthening each turn one set of nails to C^2, C^3, C^4, C^5, C^6, C^7, C^8, and cut these strands on the center line from D to E. Then cut the single thread at A. Pick up this group of threads at D and stroke, carefully, toward each end until the strands lie together. This gives us a strand of sixteen threads tapering from the center, which was at D, toward each end, 18 inches long from end to end. This short, tapered strand will be used to reënforce the bowstring at the loop. Lay this first short strand aside and make two more exactly like it. Lay each strand by itself so that they do not become tangled.



Bowyer's wax is needed in making this string. Get a cake of pure beeswax at the drug store and remelt it in a mold with about one-third rosin. The rosin hardens the wax, and it is not as sticky on the finished string. Pick up each of the six strands made, at the center, and wax from the center toward the ends, slightly — just enough to hold the threads together well. Follow Figures 4 to 10 inclusive for the last steps in constructing the bowstring. The twisting must be tight and as uniform as possible. After making a few strings, the uniformity of twisting becomes very easy. A string that is not uniform is apt to break very soon, as all parts are not sharing equal amounts of stress.

When the string is finished, slip the loop over the upper nock and then tie the plain end to the lower nock with a timber hitch. (Fig. 10.) The string will be bound to stretch somewhat when used and this amount can readily be taken up in the timber hitch.

There is one further detail that adds to the life of the bowstring, and which is also an aid in shooting. At the nocking point on the string, there is considerable wear, and experienced archers usually "serve" this part of the string with fine linen thread. Mark the exact point where the arrow nocks, then wrap both ways about 1 inch above and 2 inches below this point. The ends of the serving thread should be pulled under the last wrapping, thus leaving a smooth finish. Directly at the nocking point, a serving of silk thread will save the string from wear, and some bright-colored silk will aid in quickly finding this point each time an arrow is nocked. This serving should be thoroughly waxed.


THE BOW STRING
REENFORCEMENT STRAND
LONG STRAND
REENFORCED LOOP
D
9"
C' C²
TAPERED FROM D TO C' & C² EVENLY
Fig. 4
TAPERED END
CENTER OF STRING & PLAIN END
Fig. 5
WAX SLIGHTLY FROM D TO C' & C²
Fig. 6
GRASP AT D WITH LEFT HAND, WITH THE RIGHT, TWIST EACH STRAND TOWARDS THE LEFT, FIRMLY, AND PULL IT TOWARD THE BODY.
SOON YOU WILL HAVE THREE TWISTED STRANDS LIKE A THREE PLY ROPE.
Fig. 7
E
THEN LAY THESE STRANDS TOGETHER, KEEPING THE END EVEN,- AND TWIST ALL THREE TOWARDS YOU THESE THREE STRANDS WILL NOW LAY TOGETHER LIKE A THREE PLY ROPE AND SHOULD BE TWISTED TIGHTLY TO MAKE A GOOD DURABLE LOOP
THE TWIST SHOULD BE 1½" ON EITHER SIDE OF D., THEN WAX ONE OF THE TAPERED ENDS ONTO EACH LONG STRAND AT E.
NOW TWIST EACH STRAND AS BEFORE, (IN MAKING THE LOOP) AND ROLL TOGETHER - CONTINUE UNTIL WELL PAST THE TAPERED ENDS
Fig. 8
FINISHED LOOP
1½"
TIMBER HITCH
NOW WAX ALL THREE LONG STRANDS TOGETHER AND PUTTING THE LOOP OVER A NAIL,- TWIST THE COMBINED STRANDS TOWARDS THE RIGHT.
WAX THE COMPLETED STRING WELL AND STRETCH WELL TO TAKE OUT ALL THE KINKS.
Fig. 9
Fig. 10

A FIRESIDE BENCH

J. W. Bollinger, Tulsa, Oklahoma

A fireside bench is used, as the name indicates, in a room where there is a large fireplace. It usually has an upholstered top, to harmonize with the other furnishings in the room.

Recently some kinds of fireside benches have been converted into radio benches. The one to be described may be used for either purpose.

Make the pieces in the order in which they are presented in the bill of materials in the drawing. Shape the base curves over the anvil; bend the ends for the feet over by clamping the iron in the vise; shape the feet on the anvil. Be sure to compare both pieces as each step is accomplished, so as to make certain that they are alike, before proceeding with the next step.

Cut the two uprights, and the two cross braces. The uprights should be welded to the base pieces by the oxyacetylene process in order to be sure that the joint will be strong enough. The pieces could be fastened together by means of bolts, but the holes for the bolts would weaken the iron and incur danger of breakage. The cross braces may be fastened to the tops of the uprights with ¼-in. bolts, (and later to the scroll braces with rivets) and are used primarily to fasten the wood top to the base.

Make a full-size drawing of the scroll braces on a sheet of tin or galvanized iron, using the squares as a guide. All or part of the curves on the four scroll braces (and also parts of both curves on the two cross scrolls later) may be shaped over the same scroll former.[1] Such a scroll former will save considerable time, produce more accurate work, and heighten the interest of the worker in his job; it should be prepared before going on with the job.

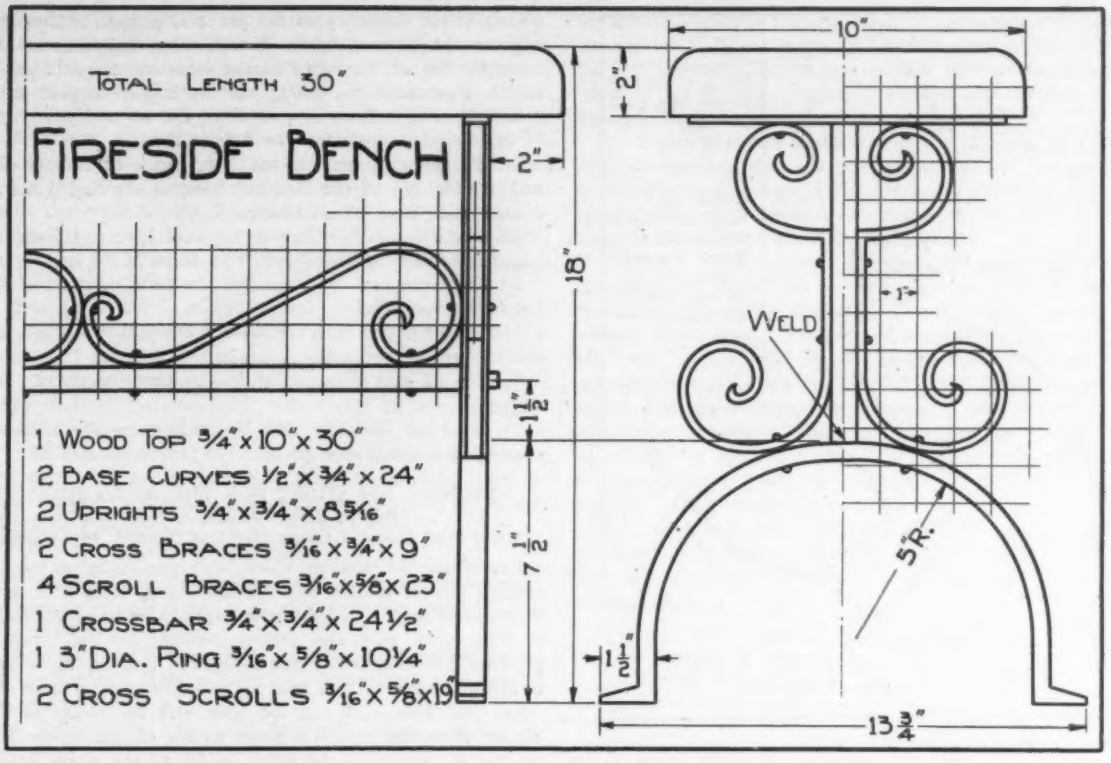
Shape the four scroll braces. Make sure all four are exactly alike, and rivet them in place as indicated on the drawing.

Cut the cross bar. Shape the ring over the anvil, or cut off a short length of 3-in. diameter pipe with the power hack saw, and rivet the ring to the center of the cross bar.

Make a drawing of the cross scrolls on a sheet of tin or galvanized iron, and shape them over the scroll former referred to above. Rivet them to the cross bar and to the center ring, as indicated on the drawing.

Thread the ends of the cross bar with a ⅜ — 16 U.S.S. tap, drill holes through the uprights, and bolt the cross bar in place. Rivet the cross scrolls to the uprights.

[1]How to make and how to use a scroll former, and how to apply a hammered finish are described in *Elementary Wrought Iron* by J. W. Bollinger.



Bolt the wood top to the cross braces with ¼-in. stove bolts.

Upholster the top so as to make a well-rounded cushion 2 in. thick. Horsehair pads taken from salvaged car cushions are excellent for this purpose.

The metal parts of the bench may be given two coats of flat black paint, or they may be enameled or lacquered in colors to suit. Another attractive finish which may be used is the so-called "hammered finish."[2]

Cover the cushion with material which will harmonize with the furnishings in the room in which the completed piece of furniture is to be put.

[2] *Ibid.*

NAILED HALF SOLES

H. P. Woodson, Boyd Junior High School, Charleston, West Virginia

There are several different types of shoes which have their own characteristics, and these must be recognized in repairing any of them. The estimating of repairs on those types which can only be properly repaired by nailing on the soles, is a problem belonging to the McKay, nailed, and standard screw type of shoes.

1. Make an estimate of the repairs needed.

2. See that you have such tools as hammer, knife, skiver, rasp, welt knife, and pincers on hand.

3. Select good sole material which will stand nailing and sewing, also some welt leather or plyable leather for rebuilding the worn edges or to fill in the holes in the center of the badly worn soles.

4. Remove the old top lift, or old rubber heels, and remove the worn sole. Save the sole and use it as a pattern in marking the new soles.

5. Mark out the new soles, making them a little larger than the old soles. Bevel the new sole at the rear end and make them ready for attaching.

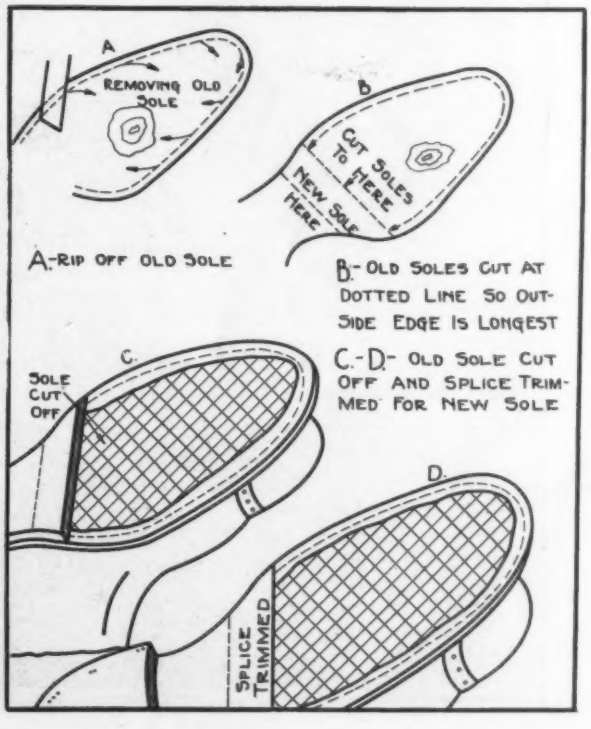
Attaching the New Soles

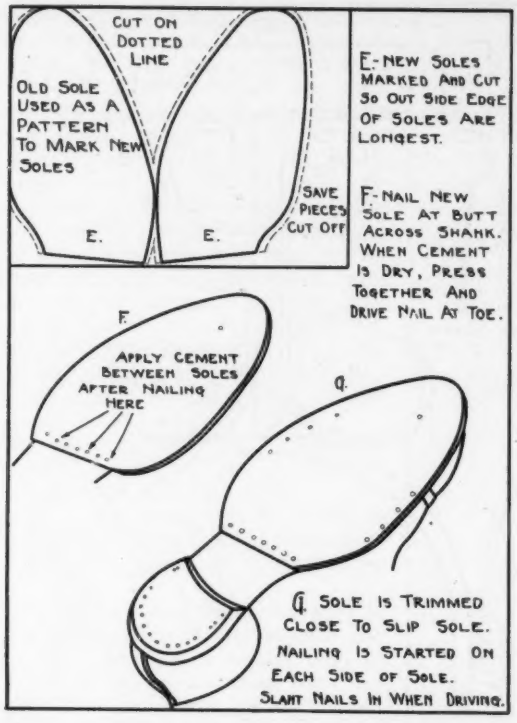
6. Place the shoe on the iron last and put the new sole on the forepart of the shoe in such a way that the butt of the new sole fits to the mark where the bevel of the old sole has been cut off.

7. Nail the butt neatly across with 6/8 nails, and then apply a thin coat of good rubber cement between the sole and the shoe bottom, and allow to dry.

8. When dry, place a tack in the toe of the sole and lightly beat with the hammer all around the sole to make it stick.

9. Trim the new sole up to the edge of the middle sole on the shoe. Mark a line ¼ in. from the edge and begin to nail




CUT ON DOTTED LINE
OLD SOLE USED AS A PATTERN TO MARK NEW SOLES
E.
E.
SAVE PIECES CUT OFF
E-NEW SOLES MARKED AND CUT SO OUT SIDE EDGE OF SOLES ARE LONGEST.
F-NAIL NEW SOLE AT BUTT ACROSS SHANK. WHEN CEMENT IS DRY, PRESS TOGETHER AND DRIVE NAIL AT TOE.
F.
APPLY CEMENT BETWEEN SOLES AFTER NAILING HERE
G.
G. SOLE IS TRIMMED CLOSE TO SLIP SOLE. NAILING IS STARTED ON EACH SIDE OF SOLE. SLANT NAILS IN WHEN DRIVING.

on each side to make the sole even. Turn the points of the nails in to the center of the sole and drive the nails neatly.

10. See that all nails are clinched, then trim the surplus sole off.

11. If the middle sole on the shoe has enough extension, stitch the two soles together on the outsole stitcher, thus adding to the durability of the job, and giving the shoe the appearance of a welt shoe. The stitching also adds to the waterproofing of the edges of the soles and helps to get a better appearance in setting up the edges. Inspect each operation.

Putting on the Rubber Heel

12. To get a smooth surface after removing the top lift and leveling, cut off the nails and hammer the heel down to a solid base. Rasp off all roughness.

13. Place the rubber heel on the heel base and fasten it in place by driving nails through the holes in the heel.

14. Take the nail set and drive the nails deeper to hold the rubber heel solid.

15. Trim the heel with the knife, and see that all nails are out of the heel and sole.

16. Place a sock lining in the shoe to insure comfort to the wearer.

17. Sand off the sole and heel edges on the finishing machine, and finish all edges with the proper color of ink.

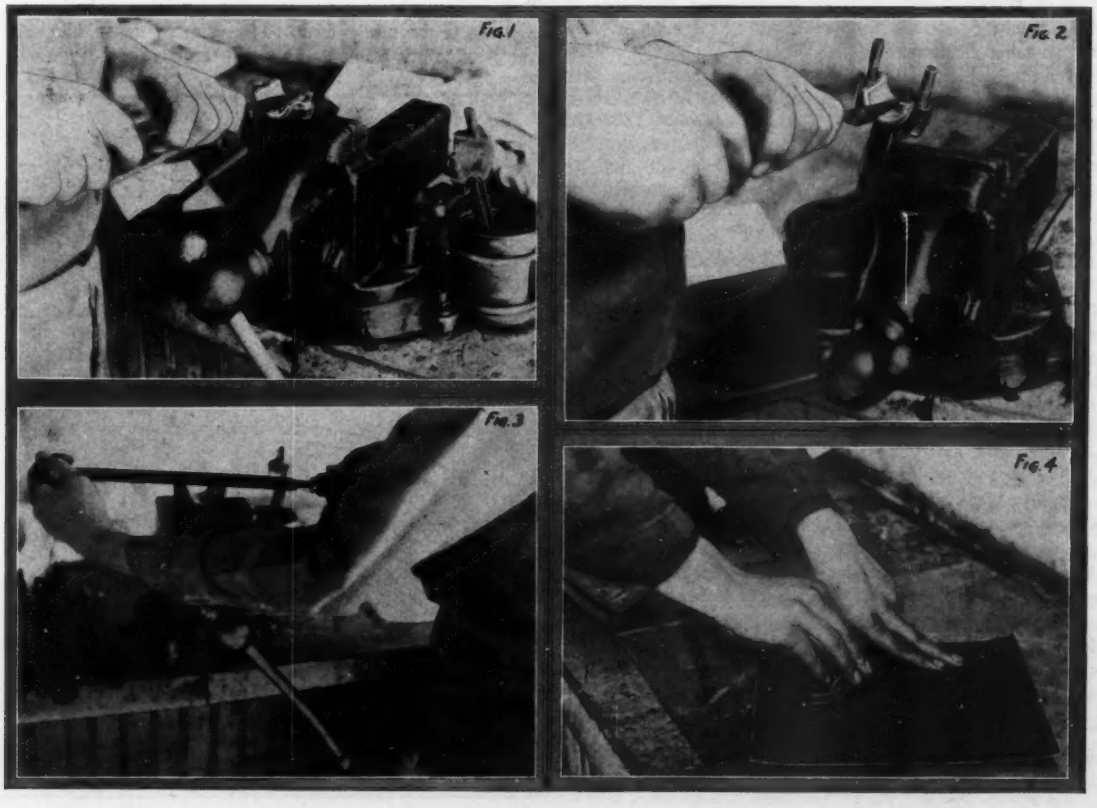
TYPICAL JOB SHEET FOR THE AUTO SHOP

Ray F. Kuns, Cincinnati, Ohio

Fitting Ford Model T Connecting Rod Bearings by Scraping

Connecting-rod bearings which have been scored or burned slightly may be refitted by scraping. Those which have been worn out of shape by operating an engine with a bearing which is very loose, may also require refitting by the scraping process. Whenever a new connecting-rod bearing cap or rod is being assembled, it is necessary to scrape it to fit to the crank pin. This work may be done with the engine in the car or when the engine is being rebuilt on the bench. The process is practically the same, so far as the actual fitting of the bearings is concerned. Instructions given for taking up on a connecting-rod bearing should be understood before attempting to scrape a connecting-rod bearing to a fit.

Bearing blue is used in bearing-scraping work in order to give what is termed an "impression." This impression shows



the nature of the fit of the bearing metal to the crank pin. Theoretically, the crank pin is round. If it is not round, it should be rounded up. The crank pin which is out of round is always made evident when fitting a bearing to it. At one point the bearing will be loose and another point it will be tight. There are certain hand-operated crankshaft tools on the market which may be used to round up an out-of-round crank pin. These remove a very slight amount of metal and leave the crank-pin metal smooth and true.

In every case it is necessary to polish the crank-pin metal to remove slight scores or abrasions which have been caused by continuous service.

The metal used in connecting-rod bearings is what is known as white metal or babbitt metal. It is composed of 86 per cent tin, 7 per cent copper and 7 per cent antimony. In some of the cheaper babbitt metals a considerable bit of lead is used. Babbitt metal is soft enough that it may be cut or scraped by means of the bearing scraper.

After an impression is made on the soft-metal lining of the connecting-rod bearing, the bearing is removed from the shaft and the impression guides the workman, as he scrapes the bearing to a fit.

Procedure

1. Assemble the bearings on the shaft. It will be necessary to remove enough shims to have the bearing metal bind on the crank pin.

2. Rotate the bearing on the crank pin by pulling on the connecting rod. This will give an impression, but one not so readily seen.

3. Remove the connecting rod and inspect for the impression.

Note: If it is desired to use bearing blue for this impression, a slight amount should be placed on the forefinger and distributed evenly over the crank pin. The bearing is then assembled and the impression is made by turning it as described just above. Some workmen prefer to get an impression without the use of the blue. As a rule, the blue will help the beginner, since the impression is plainer.

4. Remove the connecting-rod cap, preserving the bolts and shims in their original order so that they may be replaced in the same position that they had before.

5. Take the bearing and the cap to the bench vise and proceed to scrape the cap, as shown in Figure 1.

Caution: Hold the cap in the vise as shown in Figure 3. This prevents damage from springing it or from mashing the babbitt.

6. Scrape the upper half of the rod bearing, as shown in Figure 2.

7. When scraping, use extreme care to remove metal only at those points on the bearing which show as blue or high spots.

8. The bearing scraper should be swung with an easy rotating motion. It is ground with a hollow blade so that the forward-moving edge acts as the cutting portion. It will cut in either direction. When moving in one direction, the other half is also in contact with bearing metal and serves to steady the movement of the scraper so that the cutting action is smooth and not a chattering one.

9. Reassemble the connecting-rod bearings on the crank pin and make a new impression to learn whether the work is proceeding as it should.

10. Again scrape the high points and recheck on the crank pin.

Note: The scraping and checking should continue until a bearing of at least 85 per cent is secured.

Caution: It is necessary to have the shims fitted as the scraping proceeds otherwise the cap or the rod may be sprung and a false impression secured.

11. It very frequently happens in the Ford Model T that there are not enough shims provided in the bearing to allow for proper adjustment. In such cases it is necessary to reduce the cap by filing, as shown in Figure 3. Use a fine-cut mill file for this work, being very careful not to round up the edges of the cap but to reduce it equally over the entire surface of the two cheeks.

12. Many workmen prefer the use of a sheet of emery cloth for grinding down the cap instead of a file, as described above. Figure 4 illustrates the method of grinding down a cap on emery cloth. This is not so likely to result in uneven work and is recommended for the beginner.

13. When connecting-rod bearings have been refitted by scraping, they should be set up quite tight, for the reason that a perfect bearing cannot be secured readily. The newly exposed metal is not so compact or dense as that metal which has been in use. The initial operation of the engine is depended upon to finish the bearing job. For this reason the engine with newly scraped rod bearings is stiff. The first few minutes of running will serve to complete the bearing job, by running in the newly scraped and fitted bearings. Under no circumstances should the connecting-rod bearings be fitted so tight by the scraping process that the engine will not be turned over by the starting motor. When the four connecting-rod bearings have been set up, it should be possible to turn over the crankshaft by means of the turning bar or the hand crank.

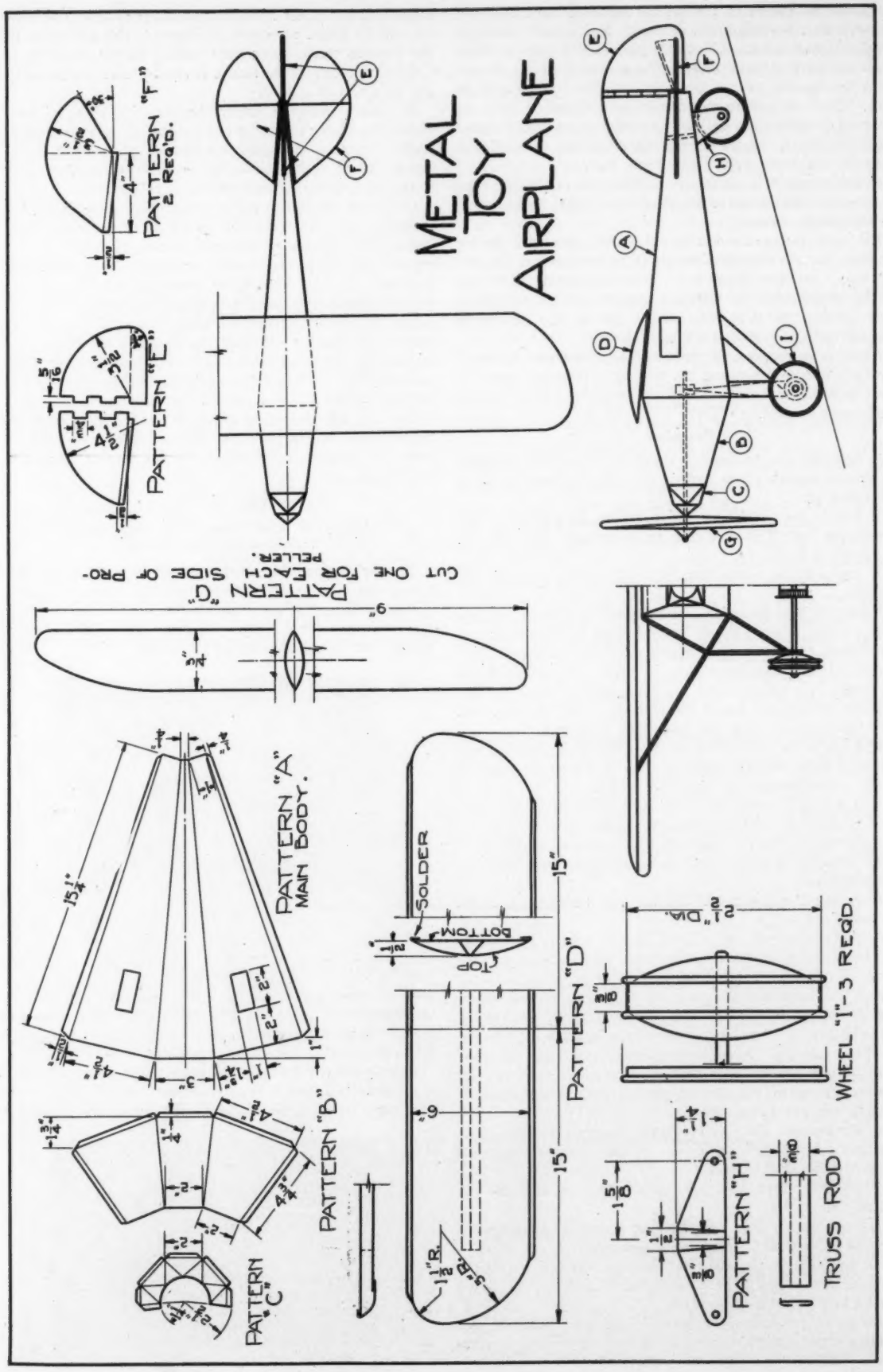
ALL-METAL TOY AIRPLANE

Francis W. Klay, Smith's Vocational School, Northampton, Massachusetts

The toy airplane described herewith excited much interest among the boys in the sheet-metal class, each boy making up one or more. The toy holds the attention of the boys, and causes them to work more carefully than when they are engaged on regular sheet-metal problems.

In constructing the airplane, regular IX furnace tin was used. Three views of the project are shown in Figure 1. Lay out pattern marked A in Figure 2. Allow for flanges at the upper and lower edges. These should be ½ in. wide at the front end and taper to ¼ in. at the rear end. Form all bends up square and solder small end together. Solder a ½-in. strip across the front lower edge, to hold the sides 3 in. apart at the bottom the same as it is at the top.

Next, lay out pattern B and solder it in place. Pattern C is a square to round fitting, the square being 2 in. on a side, and the circle 1¼ in. diameter. This is to be soldered to


METAL TOY AIRPLANE
PATTERN "F" 2 REQ'D.
PATTERN "E"
PATTERN "G"
CUT ONE FOR EACH SIDE OF PROPELLER.
PATTERN "A" MAIN BODY.
PATTERN "B"
PATTERN "C"
PATTERN "D"
SOLDER
BOTTOM
TOP
WHEEL "I" - 3 REQ'D.
PATTERN "H"
TRUSS ROD

cab B. A cone, with a 1¼-in. base, and ½ in. high, is then cut out and soldered to the round part of pattern C, forming the nose of the airplane. Some 6-lb. rivets may be evenly spaced around the 1¼-in. circle to make it appear like engine cylinders on the plane.

Next, cut out pattern E, which has two parts, as shown in Figure 2. Allow a ⅛-in. lap to solder the front half to the back of the main body A, as shown in Figure 1.

Lay out pattern F and make two. They are fastened in place by soldering the ¼-in. lap to the main body. Bend up the rear end about 10 degrees, as shown by the dotted line in the side elevation.

Lay out a half pattern for the wing D. Make two, one for the top, with ¼-in. laps on both straight edges, and one for the bottom. Before soldering the edges together, make an angle ½ by ½ by 11 in. long. Form up square as shown and force same between the two halves. Cut some off the edge of the lower sheet, if necessary, to keep it straight, while the upper sheet should be slightly curved as shown. Then solder all edges, keeping sides straight and forming ends up to meet the top sheet.

Lay out the propeller blade, shown at G. Make two. Roll slightly, as shown in center section in the pattern drawing; then twist the ends, as shown in side view in Figure 1 and solder all around edges. Drill a hole through the center for a shaft consisting of a piece of No. 9 wire, 8 in. long. Solder this in place with a small cone over the front end, as shown in the side elevation in Figure 1.

Lay out pattern H, for the rear-wheel fork. Punch two ⅛-in. holes and form up square. An axle will be soldered into the wheel projecting out about ¼ in. on each side for a journal. This fork H can be soldered solid to the plane or can be put on with a pin going up through the plane, to allow the wheel to turn like the caster on a table leg.

The wheels are made out of some small-size tin cans 2½ in. in diameter, as shown at I. Cut off the bottom part of the can, leaving a ⅛-in. rim, to which the tire of the wheel is soldered. Two bottoms will be required for each wheel. Punch 5/32-in. center holes for the axles. Cut a piece of tin ⅜ in. wide and 8 in. long, and solder it to the outside of the can bottoms as shown.

Make the truss rods for the front wheels and the wing struts ⅜ in. wide with ⅛-in. hem on both edges as shown. The front axle is of No. 9 wire about 8 in. long. This is run through the bearings in the front-wheel trusses and it is then soldered to the wheels.

Some of the planes made had small pulleys on the inner end of the propeller shaft and in the center of the front axle. An elastic band may be used for a belt, as shown in Figure 1. This drives the propeller from the wheels when the plane is drawn along.

A gear-shaped wheel may be soldered to the pulley on the front axle. A piece of light spring steel should then be soldered to the underside of the plane, so that the loose end presses lightly against the gear-shaped teeth. The noise produced when the plane is dragged along resembles the noise of the motor on a real plane. A small ring may be soldered to the front center of the wing. To this may be tied the string used for drawing the plane.

After assembly, these planes may be painted with aluminum paint, and the number and stars may be painted on with blue and red paint.

A CORRECTION

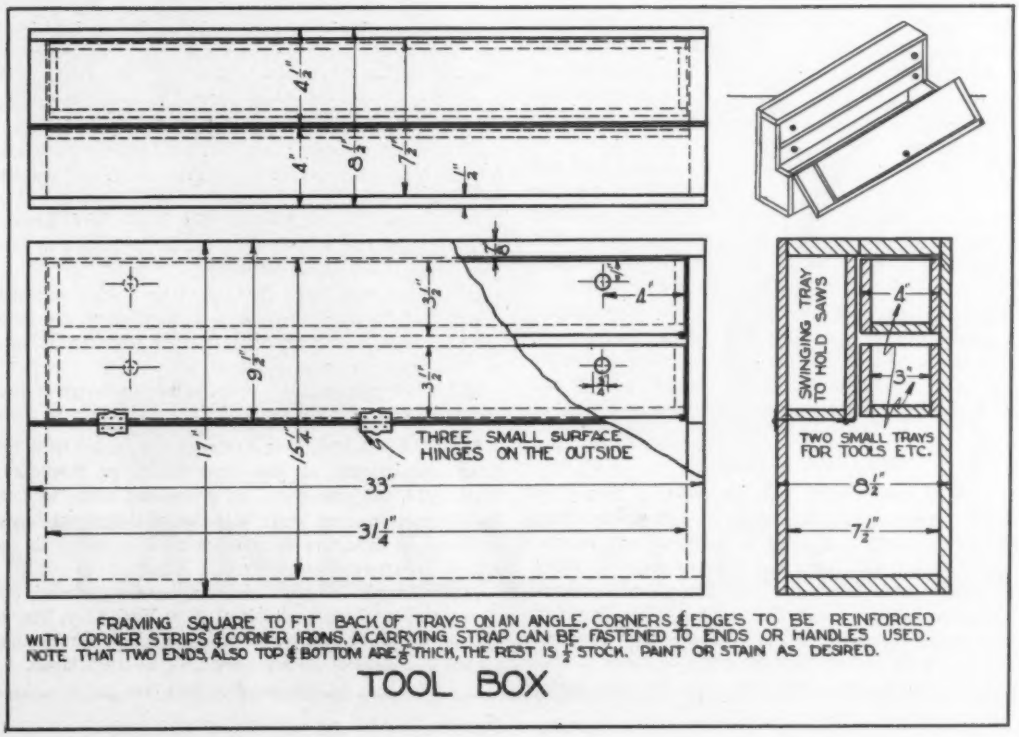
The paragraph on the validity of the industrial-arts test II, mechanical drawing by Nash and Van Duzee, on page 126 of the April, 1930, issue of the INDUSTRIAL-ARTS MAGAZINE, erroneously states that the analysis was sent to 85 teachers, supervisors, and directors of industrial arts in cities ranging from a thousand to over 4,000,000 population, when, as a matter of fact, the number of teachers, supervisors, and directors to whom it was sent was 485.

TOOL BOX

Glenn H. Osborne, High School, Ottumwa, Iowa

The tool box described herewith is made with the ends, top, and bottom of 7/8-in. stock. The sides are of ½-in. material. Plywood, ⅜ in. thick, also could be used for the sides, thus making the box much stronger.

If preferred, the swinging tray can be dispensed with and the saws put in the lower part of the box. If this is done, the trays should be made wider to extend across the top of the box, and the lid narrower. The ends may then be rounded instead of being made square.



FRAMING SQUARE TO FIT BACK OF TRAYS ON AN ANGLE. CORNERS & EDGES TO BE REINFORCED WITH CORNER STRIPS & CORNER IRONS. A CARRYING STRAP CAN BE FASTENED TO ENDS OR HANDLES USED. NOTE THAT TWO ENDS, ALSO TOP & BOTTOM ARE ⅞ THICK, THE REST IS ½ STOCK. PAINT OR STAIN AS DESIRED.

TOOL BOX

NOW, ARE THERE ANY QUESTIONS?

FINISHING GUMWOOD

909. Q.: How is it possible to finish gumwood like we see it finished on bought furniture? — *C. O. S.*

A.: Sponge the wood to raise the grain, dry and resand. Stain with a standard four-ounce walnut or mahogany water stain, dry overnight. Size with a two-pound cut of orange shellac, dry, and sand with a split 6/0 garnet finishing paper. While it may appear that a close-grained wood like gum does not need filling yet this wood distinctly responds to the use of a dark silex filler made up about 10 pounds of paste per gallon of thinner. Apply to the sanded shellac coat; pad in well; wipe off clean; dry 24 hours in a warm room, then brush on a coat of standard four-hour varnish. Sand between coats which have dried overnight. The last coat should be rubbed with FFF pumice stone, felt pad and crude oil. Clean up with a rag wrung out of water by rubbing the last traces of oil and pumice from the work since this method will give the soft semigloss finish turned out commercially. Be very careful to rub one way only. — *Ralph G. Waring.*

NONSLIP FLOOR FINISH

910. Q.: What treatment would you advise for a wood floor in a general metal shop. The particular shop floor for which we desire the proper finish is a two-year-old maple floor which has been treated with Car-na-var and is installed in a woodworking shop, there being no trucking. We find this floor to be dangerously slippery and rather than cover it with rubber matting, would prefer to give it some sort of nonslip finish. — *L. J. E.*

A.: The maple floor should be carefully cleaned, preferably by judicious mopping with a weak solution of Gold Dust and clean water. Let dry overnight, then apply a well-brushed-out coat of good floor varnish, to a small section of the floor; preferably as far away from the proposed exit to be used, as possible.

While the varnish is still wet, especially if it is of the more to be preferred "4-hour" type, it should be generously sprinkled with sharp sand, either by broadcasting as for sowing by hand, or by sifting from a small box, covered with doubled fly screen or finer. The box should be attached to a rather long handle.

Continue the alternate varnishing and sanding until the entire floor is covered. Allow as long as possible for drying before using in order that the varnish may have hardened perfectly and thereby increased its adhesion to the last degree. This method gave entire satisfaction on a similar maple floor used in a woodshop, and which had become so polished from shavings and wood dust as to be very dangerous after power machines had been installed. Worn spots, from which the sand has become abraided can be readily touched up with 4-hour varnish at the end of the day and again put in service after an overnight drying. — *Ralph G. Waring.*

SHELLAC STICKS

913. Q.: Will you kindly tell me what is meant by "shellac stick," and where I can obtain it? I want something to use for filling small nail holes on stained surfaces, and have been told shellac stick is the best thing to use. — *L. M. G.*

A.: A shellac stick is merely a small piece of hardened shellac, which looks very much like a stick of sealing wax. The shellac sticks come in various shades. They are used to fill holes by being melted into the holes, allowing a little of it to stick over the top. This can then be sandpapered down to make a smooth surface. They may be obtained from dealers who handle wood-finishing supplies.

AMONG the INDUSTRIAL ARTS TEACHERS

MR. SIDNEY OWEN GOES TO NEBRASKA

Mr. Sidney Owen, who has been elected state supervisor of trade and industrial education in Nebraska, was formerly director of vocational education in the high school at Phoenix, Ariz. He succeeds Mr. H. L. Freeland, who resigned to accept a position in Hawaii.

MR. SIDNEY OWEN
State Superintendent of Trade and Industrial Education, Lincoln, Nebraska

Mr. Owen, who is a machinist by trade, received his education in the University of Arizona and the Colorado State College. He received his primary and secondary-school education in California, following which he served his apprenticeship at the machinist trade. After a few years spent in the shop as a journeyman machinist, he went out as a salesman for machine tools, power farm machinery, and contractors' supplies.

In 1923 he went to Phoenix as a high-school instructor of machine shop and related subjects. He remained in this position for two and one-half years.

In 1926 he was made director of vocational education for the city of Phoenix, working as a member of the faculty of the Phoenix Union High School, which position he continued to hold until his present appointment.

In his new position, Mr. Owen will have charge of the trade and industrial-training work of the entire state of Nebraska.

Mr. F. C. Lampe, who has been connected with the education department of the American Type Founders since May, 1929, has announced his retirement from the firm. Mr. Lampe was for seven years in charge of the school department of Barnhart Brothers & Spindler until a change in the firm caused his transfer last year.

Miss Edith L. Nichols has been appointed assistant director of art in the schools of New York City. Mr. Forest Grant, formerly director of art in the high schools, has been placed in charge of all art work done in the schools.

(Continued on Page 32a)

Tools for the School Shop

Catalog No. 26

The variety of Stanley Tools which fulfills the requirements of School Shops is ever increasing. In the Stanley line there are now tools for:

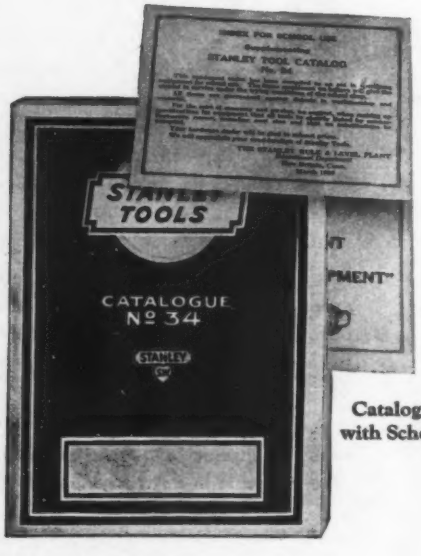
The Woodworking Shop
The Metal Working Shop
The Automobile Shop
The Machine Shop
The Electrical Shop

New catalogs shown here describe the tools of particular interest to instructors. Use them as reference books when making up your list of equipment for the coming year.

Copies will be sent promptly upon request

THE STANLEY RULE & LEVEL PLANT
Educational Department
New Britain, Conn.

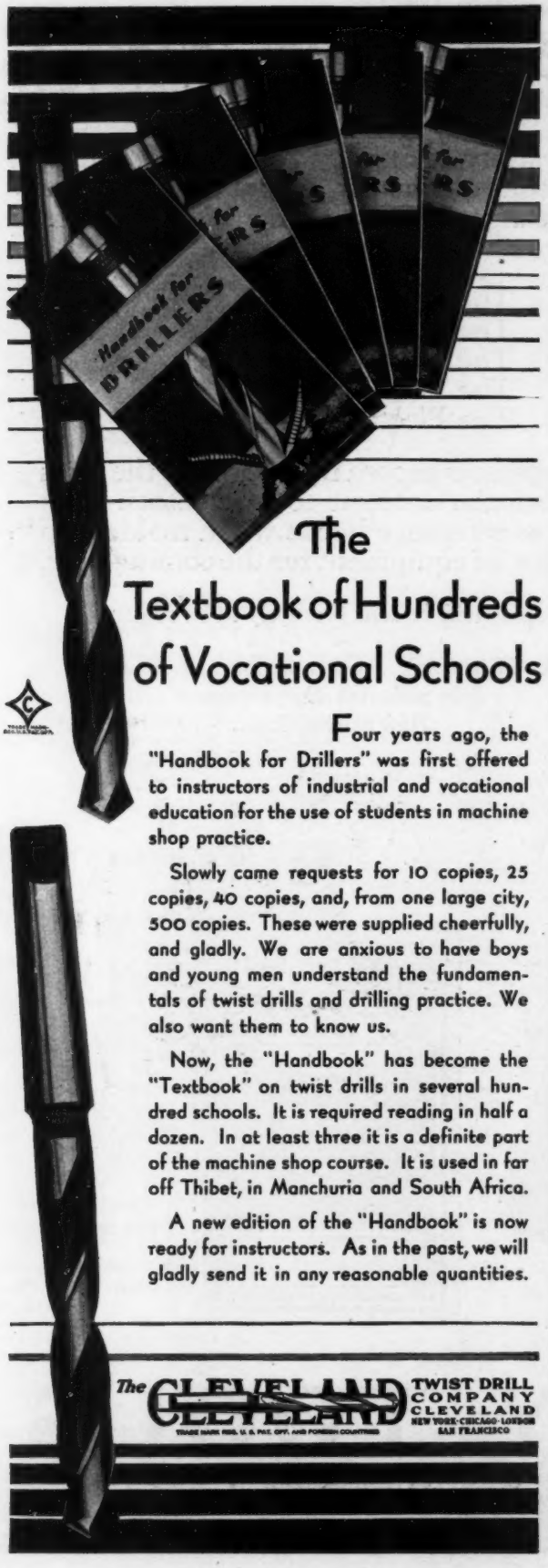
Catalog No. 25



Catalog No. 34
with School Index

STANLEY TOOLS

Stanley Equipment is Standard Equipment


Handbook for DRILLERS
The Textbook of Hundreds of Vocational Schools
Four years ago, the "Handbook for Drillers" was first offered to instructors of industrial and vocational education for the use of students in machine shop practice.
Slowly came requests for 10 copies, 25 copies, 40 copies, and, from one large city, 500 copies. These were supplied cheerfully, and gladly. We are anxious to have boys and young men understand the fundamentals of twist drills and drilling practice. We also want them to know us.
Now, the "Handbook" has become the "Textbook" on twist drills in several hundred schools. It is required reading in half a dozen. In at least three it is a definite part of the machine shop course. It is used in far off Thibet, in Manchuria and South Africa.
A new edition of the "Handbook" is now ready for instructors. As in the past, we will gladly send it in any reasonable quantities.
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
SAN FRANCISCO

(Continued from Page 206)

MR. HARTMAN DIGNOWITY, who had been with the University of Texas Extension Division in the teacher-training department for the past three years, has accepted a position with the Humble Oil and Refinery Company at Baytown. In his new position, Mr. Dignowity will have charge of the safety, educational, and welfare work of the firm which employs several thousand workmen. His present position was obtained as a result of his splendid work as a foreman-conference leader in the large industries of Texas.

THE MARCH MEETING OF THE BOSTON VOCATIONAL SOCIETY

The Vocational Education Society of Boston held its regular monthly meeting on Saturday, March 7, in the Hotel Westminster, Boston. Following the dinner, a short business meeting was held, at which two new members were elected to membership in the society.

Dr. Fred Smith, director of placement in the Graduate School of Education, Harvard University, was the speaker of the evening, taking for his subject, "Means and Methods of Measuring Communities to Determine the Types of Vocational Education to be Inaugurated in the Schools." Dr. Smith stressed the fact that in our everchanging social order, the curriculum of today might be almost worthless tomorrow. During the course of his talk, he referred to the data obtained from two studies, one of the machine-tool industry in Cincinnati, and one of a soap manufacturer for the chemical engineers.

Organized labor, industry, and the schools are vitally interested in the curriculum of the vocational schools. The old apprenticeship system has failed to produce either the quantity or the quality of skilled workmen necessary. The corporation school has trained for a specific employment and is too narrow. The old system represented independent action by the schools, the industry, and organized labor, but a union of all three is necessary to have an efficient organization.

Speaking of the intelligence required of workmen, Dr. Smith referred to a New York taxi concern which had made a study of the intelligence necessary for a taxi driver. As a result, the firm stopped employing drivers with a high I.Q., for it was found that the labor turnover was less and accidents were less with drivers who had less intelligence, but who attended strictly to business. Dr. Smith continued by saying that in the schools he considered the pupils with a high I.Q., much more of a problem than the pupils with a low I.Q. Most of the problem cases come from pupils with an I.Q. of 150, according to Dr. Smith. At the close of his talk, Dr. Smith answered many questions put by the teachers present. — *Louis A. Van Ham.*

THE MEETING OF THE NEW YORK SCHOOL CRAFTS CLUB

The regular meeting of the School Crafts Club of New York was held on March 15.

The meeting opened with a talk by a representative of the General Electric Company, who discussed the manufacturing methods of refrigeration. Mr. Downey, of the Balsa Wood Company, Brooklyn, described the development of the industry. Balsa wood is used as insulator for aeroplanes, for refrigerator cars, trucks, and heavy machinery. There are three kinds, soft, medium, and hard, and the crushing strength is 150 pounds per square inch. Mr. Wagar, of New

(Continued on Page 34a)

Teach on
REED-PRENTICE
Sliding Gear Head Lathes

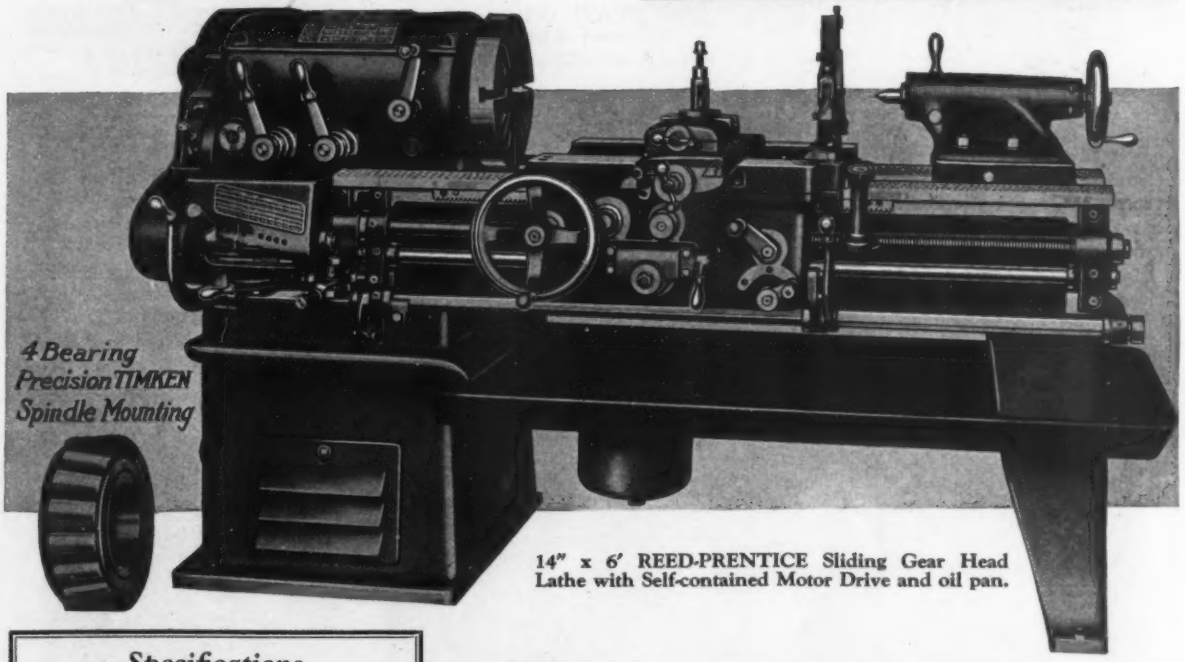
adopted by industry
simple
rugged
accurate and economical

Meeting every requirement for modern machine shop instruction.

Setting, with new features incorporated, a new standard in lathe construction and performance.

For use with High Speed Steel or Tungsten Carbide Tools.

(Above and at right) Worcester Boys' Trade School—one of the first and foremost institutions of its kind — a user of REED-PRENTICE Sliding Gear Head Lathes.



14" x 6' REED-PRENTICE Sliding Gear Head Lathe with Self-contained Motor Drive and oil pan.

Specifications

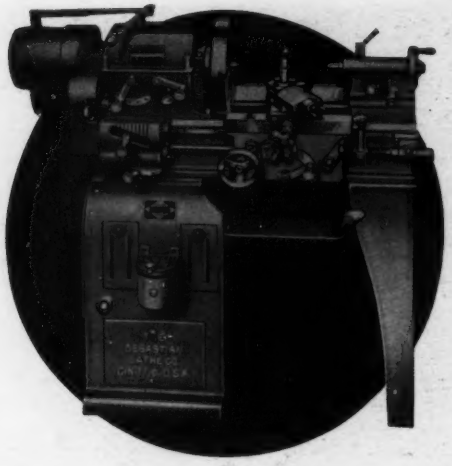
	14"	16"
Swing over ways	14½"	16½"
Swing over compound rest	9"	11"
Distance between centers, 6' bed	31"	31"
8 Spindle Speeds, range	18 to 432 RPM	
41 feeds, range	.0035 to .112	
41 threads, range	3 to 96	

Standard Equipment includes single pulley drive, compound rest and tool post, large and small face plates, steady rest, thread chasing dial and wrenches.

COMPARE THIS HEADSTOCK CONSTRUCTION: Only 9 gears for 8 spindle speeds. Impossible to engage conflicting gear ratios. Gears of SAE 3250 Electric Furnace Steel, hardened to Rockwell test of C55 to 58, running in bath of oil. Gear teeth are burnished. Gears slide on multiple spline shafts of heat treated nickel chromium steel running in ball bearings. Multiple disc clutch and brake for quick start and stop controlled from apron and quick change bank. Spindle of SAE 6140 heat treated Chrome Vanadium Alloy steel running in four bearing Precision TIMKEN mounting.

Send for bulletins covering features and specifications in detail.

REED-PRENTICE CORPORATION
Worcester, Mass., U.S.A.



AND NOW—

—Sebastian goes Timken

The Gold Seal 11" Lathe has been equipped with Timken Bearings and now ranks as the most modern of small engine lathes. It is the heaviest 11" lathe built, combining a 16 speed motor drive with accuracy up to .0005". In this machine you have the ideal small lathe for school purposes. The motor is built in the leg underneath the headstock, and there is a cabinet below the motor for tools, etc. It is steel geared throughout and has all safety features, so important in the school shop. There is no shifting of belts and the motor chain is guarded with cast iron guards. You should investigate this improved lathe before going any further.

A Lathe Without an Alibi.

16 Speed Motor Drive.
.0005" Accuracy.

Write for complete information.

Gold Seal SEBASTIAN LATHES GUARANTEED CORRECT

THE SEBASTIAN LATHE CO.
CINCINNATI, OHIO
444 Culvert Street
New York Office—Room 372—50 Church Street

TIMKEN BEARINGS SUPPLIED

(Continued from Page 32a)

Rochelle, talked on industrial arts. He discussed acquired skill, technical knowledge, driving power, and explained the process of acquiring power in an industrial age. He pointed out that one should have a definite idea of methods of procedure, and a regard for individual capacity and aptitude.

In conclusion, the meeting took up the aims and objectives of industrial arts.

The next meeting will be devoted to a discussion of the aims and objectives in the industrial-arts field. — *N. A. Crow.*

THE 1930 AMERICAN VOCATIONAL ASSOCIATION CONVENTION IN THE MAKING

On Saturday, March 22, 1930, a well-attended dinner meeting was held at the Schroeder Hotel at Milwaukee, Wis., at which the preliminary plans for the 1930 convention were formulated. Paul W. Chapman, president of the A.V.A., Z. M. Smith, secretary, and Leonard Wahlstrom, manager of exhibits, were the visiting guests.

Dr. R. L. Cooley, past president of the A.V.A., was elected chairman of the local arrangements committee.

(Continued on Page 37a)

PREPARING FOR THE 1930 A. V. A. CONVENTION

(Continued from Page 34a)

At a meeting of the Wisconsin Vocational Association, which immediately followed the dinner meeting, further preliminaries were discussed.

WESTERN ARTS ASSOCIATION MEETING

The program committee is rapidly completing the arrangements for the meeting of the Western Arts Association, to be held May 6–9, at Minneapolis, Minn. The Transcontinental and Western Passenger Association and other roads have allowed a rate of one and one-half fare. Tickets at the normal one-way tariff fare for the going journey may be purchased from April 30 to May 8. All teachers should obtain tickets and certificates at least thirty minutes before the departure of the train.

The theme of the convention will be "Adjustment of the Arts to Modern Education," which is a subject of vital importance to every teacher of the arts. The sectional meetings will be well worth while, and the school exhibits give promise of measuring up to the usual high standard.

A splendid program of speakers and topics has been arranged by the program committee. Among the speakers are Dr. John Shapley, of the University of Chicago; Miss Esther W. Wuest, of Portland, Oreg.; and Mr. Edward W. Mathews, of Chicago. There will be a number of new speakers on the program, who will present some practical and usable work to the teachers.

The Leamington Hotel will be headquarters, with the Curtis Hotel, directly across the street, assisting with meetings and the housing of delegates.

PITTSBURGH INDUSTRIAL-ARTS SOCIETY HOLDS MEETING

The Industrial-Arts Association of Pittsburgh, Pa., held a meeting and dinner in the North Side Y. M. C. A. Building.

Mr. C. B. Connelley, the speaker of the evening, gave an interesting talk, in which he traced the beginning of industrial work in the Pittsburgh schools. Mr. Connelley was a pioneer in this work, having started in North Side Pittsburgh about 35 years ago. He was given a life membership in the association. Mr. John Hawthorne, Mr. Joseph Speer, and Mr. James Glenn, familiarly known as the three J's, contributed to the historical aspect of the occasion by their reminiscences both humorous and serious.

At the meeting, which was known as president's night, all but E. C. Carter of the former presidents were on hand, and responded with a bit of history, a timely joke, or some needed advice. Before the meeting adjourned, President Ingram presented the former presidents with wooden, left-handed monkey wrenches for tightening down and loosening up. — *R. K. Beamer.*

HOLD NINTH ANNUAL PRINTING CONFERENCE AT PITTSBURGH

The ninth annual conference on printing education was held June 23–25, at the Carnegie Institute of Technology, Pittsburgh, Pa.

Among the speakers on the program were Mr. Norman T. A. Munder, Baltimore; Mr. L. H. Dennis, Harrisburg; Mr. O. W. Fuhrmann, New York; Dr. G. Valentine Kirby, Harrisburg; Dr. Gerald D. Whitney, Pittsburgh; Prof. David Gustafson, and Mr. Glen U. Cleeton of Pittsburgh; Mr. Allan Robinson, of Baltimore; Dr. D. H. Taylor, New York City; Miss Eleanor Tripp, Washington, D. C.; and Mr. George Ortleb, St. Louis, Mo. — *F. J. Hartman.*

CALIFORNIA CONFERENCE ON INDUSTRIAL-ARTS EDUCATION

A conference on industrial-arts education was held at Fresno, Calif., at the call of Mr. Vierling Kersey, state super-

(Continued on Page 40a)

Make your pliers budget go farther this year

IF your files do not contain this Vacuum Grip Booklet, we suggest that you write for a copy before making your annual requisition for pliers.

It throws a new light on pliers construction—explains in terse, non-technical terms the fallacy of *case hardened* (*surface hardened*) soft open hearth steel used in ordinary pliers—and the sound logic that has kept us unswervingly to the principle of using only the finest electric furnace alloy tool steel in Vacuum Grip Pliers, hardened and tempered *thru and thru!*

Sound logic from *your* viewpoint, also, for the long life imparted to Vacuum Grip Pliers by this superior steel and our exclusive heat-treatments, means a marked economy in your pliers budget!

Over fifty Vacuum Grip patterns—many of them valuable as an adjunct to manual training, are illustrated in this interesting booklet. Write for a copy—today.

In the meantime, let us send you samples of the three patterns shown above—all widely used in school work.

Upper—No. 107—Angle Nose Grippers. Takes the place of many pairs of pliers and wrenches. Stillson-angle teeth get a sure hold on any object. Length 7".

Center—No. 137—Many-purpose Pliers for cutting, gripping, pulling and twisting. Adjustable joint gives jaw opening of 1¼" for nuts, pipes, rods, etc. Over 100,000 in daily use. Length 7".

Lower—No. 96—Heavy Duty Diagonal Cutters. Cutting edges perfectly matched. A finely fashioned precision tool of great durability. Length 6".

We will be glad to quote special prices on these patterns, as single samples or in lots to meet your needs.

FORGED STEEL PRODUCTS CO., Newport, Pa.

Over 600,000 in use

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Pliers

Built UP to a Standard—Not DOWN to a Price

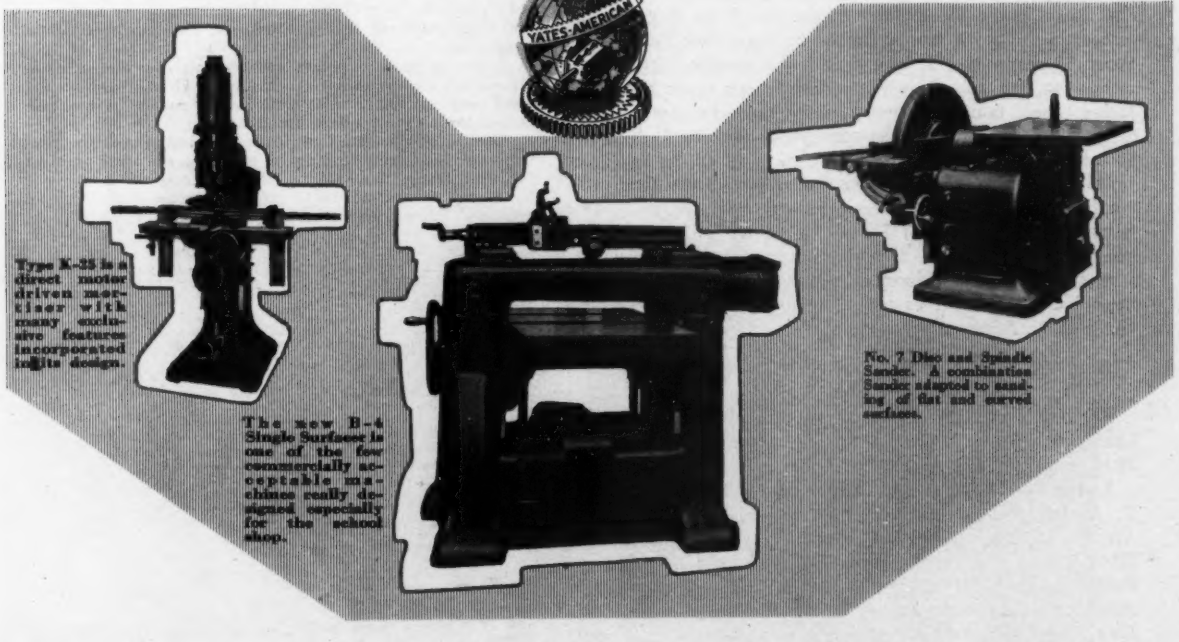
USED AND ENDORSED BY LEADING MANUAL TRAINING SCHOOLS

Yates-Amer

THE DOMINANT FACTOR
WIDE ACCEPTANCE OF
SHOP

Instruct your students today on

A KEEN realization of the needs of the work shop have enabled Yates-American designing engineers to embody in Yates-American machines the features and quality that have carried them to the peak in the woodworking industry. Woodworkers in all parts of the world unite in acclaiming Yates-American quality. Because of this high standard of quality and almost universal acceptance by industry, school shop teachers have been quick to acknowledge Yates-American supremacy and equip their school shops accordingly. By so doing, they give their students the opportunity of learning on machines they will encounter upon leaving school. These and other facts must be taken into consideration in the purchase of machinery for the school shop.



Type K-25 is a direct motor driven mortiser with many exclusive features incorporated in its design.

The new B-4 Single Surfacer is one of the few commercially acceptable machines really designed especially for the school shop.

No. 7 Disc and Spindle Sander. A combination Sander adapted to sanding of flat and curved surfaces.

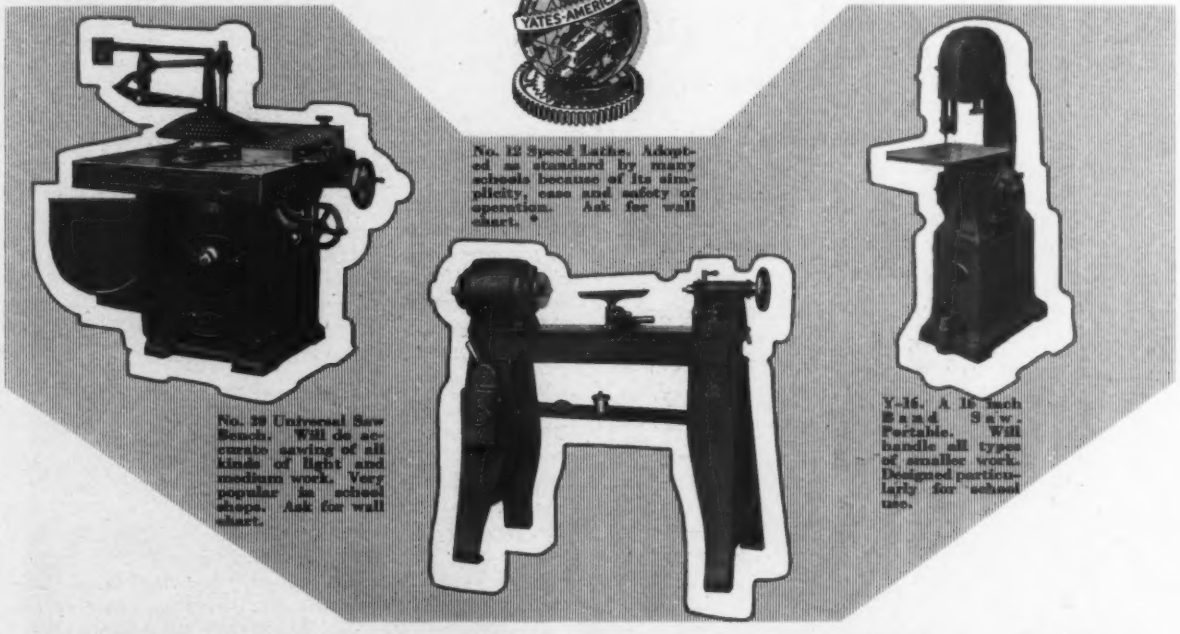
Before ordering your new equipment investigate the Yates-American line. Write for a copy of our new school catalog, showing a complete line of school machinery and accessories. Sent free on request at no obligation to you.

ican Quality

THAT IS INFLUENCING THE THESE MACHINES BY SCHOOL TEACHERS

machines they will use tomorrow

YATES-AMERICAN machines are durable. Built oversize to withstand the ravages of high speed production, they last almost indefinitely in the school shop. The question of safety, which is so important in these shops where inexperienced hands are using machines, is given special consideration. On Yates-American machines all working parts are scientifically guarded. Accuracy is another factor, and designed and built as they are, Yates-American machines can produce no other than accurate work. Dependability, safety and accuracy are features that must be considered in ordering machines for the school shop and it is the embodiment of these that has enabled Yates-American machines to attain their present leadership.


No. 12 Speed Lathe. Adopted as standard by many schools because of its simplicity, ease and safety of operation. Ask for wall chart.
No. 28 Universal Saw Bench. Will do accurate sawing of all kinds of light and medium work. Very popular in school shops. Ask for wall chart.
Y-16. A 16 inch Band Saw. Portable. Will handle all types of smaller work. Designed particularly for school use.

YATES-AMERICAN MACHINE CO.

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"...experts test 'Yankee' blades—each and every one of the hundreds of thousands."

"YANKEE" must make this test of screw-driver blades—each and every one!

Because, — "Yankee" on the tool you buy must always mean the utmost in quality, efficiency, and durability.

"Yankee" blades won't twist, crack, break, or bend on the edge.

Every blade is "Yankee"-fastened in the handle, and can't be loosened by use or abuse.

Well balanced and with comfort grip, a "Yankee" Screw-driver makes work easier. Sold and guaranteed by your tool dealer. Ask for "Yankee".

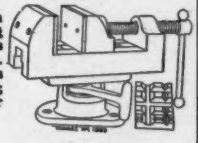
"Yankee" Plain Screw-drivers

No. 90. —Standard Style. Fifteen sizes: 1½" to 30" blades. Price, 5" blade, 50c; 6", 55c; 7", 65c; 8", 75c.

No. 95. —Cabinet Style. Eleven sizes: 2½" to 15½" blades. Price, 4½" blade, 40c; 5½", 45c; 6½", 50c; 7½", 60c.

"Yankee" Vise No. 1993

Removable from base for holding work on drill-press or other machines. True all sides. Jaws open, 3½ inches; price, $9.90. Other sizes, $3.75 up.



"YANKEE" TOOLS

MAKE BETTER MECHANICS

NORTH BROS. MFG. CO., Philadelphia, U. S. A.

You may send "Yankee" Tool Book (offered in Industrial Arts) —Showing Spiral and Ratchet Screw-drivers, Automatic Push Drills, Ratchet Braces, Socket Bit-Extensions, Ratchet and Plain Breast and Hand Drills, Automatic Chain and Bench Drills, Ratchet Tap Wrenches, Continuous-Work Swivel Vises, Plain Screw-drivers, Etc.

(Please clip and write name and address in margin below)

(Continued from Page 37a)

intendent of public instruction. Mr. J. C. Beswick, chief of the bureau of industrial education of California, presided at the sessions. The conference was attended by the heads of the departments of industrial arts in the state universities and state teachers' colleges, and by the supervisors of industrial arts in the large cities.

The conference took up a discussion of the aims and objectives of courses in industrial-arts teacher training in the state universities and state teachers' colleges, in which the following points were significant:

a) A higher standard of qualifications and preparation of teachers of industrial arts in the state through courses in the universities and teachers' colleges, dealing with the aims, scope, and results of industrial-arts teaching.

b) That the aims of industrial-arts teaching in the schools should be educational.

c) That the vocational part of the educational system is that which is organized and supported jointly by federal and state funds for specific vocational and trade teaching.

d) That these aims and objectives may be realized through unified courses of training in the state universities and teachers' colleges by regulations governing the granting of state teachers' credentials and county certificates in the state.

In the afternoon session, the discussion took up the introduction of instruction in airplane and glider construction as part of the industrial-arts work in the schools and the need and advantages of a course. The necessity of credentials for teachers to teach this kind of work in the schools was discussed and a recommendation adopted. The most important topic during the conference was that relating to the number of teachers holding so-called vocational-arts credentials.

The superintendent's attention was called to the points that the city supervisors were advised to inform teachers in their respective fields holding vocational-arts credentials to get busy and enroll in teachers' classes in order to meet the new requirements and qualifications for industrial-arts teachers; that the regular academic teachers now teaching special subjects will be required in the future to obtain special credentials for such work; to determine to what extent these two things may be made retroactive, if at all. The report from the various cities indicated that there is anxiety among the great number of teachers holding vocational-arts credentials.

Another discussion took up the need of a suggestive and unified course in industrial-arts work in the schools of the state. In this connection, the manual-arts work of Los Angeles was discussed and favorably commented upon.

A summary of the discussions brought out the fact that the schools of California have "gone educational" with reference to industrial-arts work. This is an objective toward which the supporters of the industrial-arts movement have worked for a number of years.—*C. A. Kunou.*

WISCONSIN INDUSTRIAL-ARTS ASSOCIATION BEGINS WORK ON CURRICULUM

The Wisconsin Industrial-Arts Association has begun work on the revision of the curriculum. The committee in charge of the work is composed of seven members, including the following:

Mr. Ben Meyer, Chippewa Falls, administration; Mr. E. S. Lamoreaux, Janesville, curriculum building; Mr. O. L. Wakeman, Fond du Lac, guidance and counseling; Mr. C. W. Byrnes, Green Bay, legislation; Mr. Herbert Rosenow, Merrill, nominations; Mr. Frank Walsh, Oshkosh, publicity; Mr. Roy Van Duzee, West Allis, teachers' qualifications. — *Frank W. Walsh.*

NEW JERSEY VOCATIONAL AND ARTS ASSOCIATION HOLDS MEETING

The New Jersey Vocational and Arts Association held its fourteenth annual meeting March 21–22, at the Whitman

(Continued on Page 43a)

INCENTIVES—
TO ACCOMPLISH BETTER WORK

ROUSE NEW QUARTER POINT COMPOSING STICK

The Rouse Quarter Point Stick, in addition to being adjustable to pica and half pica measure, can also be adjusted to quarter points. Easily adjusted, these new sticks serve as an incentive to the accomplishment of better work. The stick, when properly locked to any set width is positively accurate and its sturdy construction assures permanent accuracy.

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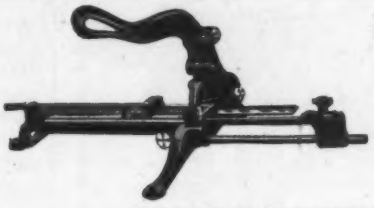

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(Continued from Page 40a)

Hotel, Camden. Pres. John J. Hatch, of Newark, was in charge.

At the supervisors' and directors' meeting, Mr. M. J. Corcoran, of Elizabeth, presided. The topic, "Objectives of Practical-Arts Work in High Schools" was taken up. Mr. T. C. Sheehan and Mr. C. H. Heiss gave talks.

At the fine-arts meeting, Miss Jean Mitchell, of Newark, was in charge. The topic was "Sources of Illustrative Material and Use." There were a number of round-table discussions.

At the printing meeting, Mr. R. P. Gallagher, of Elizabeth, presided. The topics were, "How Type Faces are Designed," "The Printshop and the School Publication," "American Type Contribution," and "Printing Education and the Linotype."

At the vocational-guidance meeting, Mr. Robert Hoppock, of Rahway, was in charge. The topic was, "Psychology and Vocational Adjustment." Mr. A. T. Hookway, of Bayonne, spoke on "Guidance at the Bayonne Vocational School," and Mr. Alexander Goldberg, of Nutley, talked on "The Technique of Interview."

At the industrial-arts meeting, Mr. Henry Larzelere, of Millville, presided. The topic was, "Objectives of Industrial Arts."

THE OSWEGO BOYS' DINNER

The 30th annual dinner of the Oswego Normal Boys' Club of New York was held March 1, at the Hotel Woodstock, Oswego, N. Y. The dinner was attended by 40, and classes from 1892 to 1929 were represented, the class of 1929 carrying off first honors with eleven representatives present.

The club had as honor guests, Dr. Riggs and Dr. Park, of Oswego Normal, and Dr. N. H. Dearborn, of New York University. The meeting was in charge of Mr. Robert Peterman, president, who acted as toastmaster and introduced the speakers.

Mr. Peterman, the first speaker, talked on "The Aim of the Oswego Boys' Club, which was interpreted as "good will toward fellow men." He told of the establishment of the club some thirty years ago, and of its continued growth during the years which have passed. There are now over 250 Oswego boys teaching within a radius of 50 miles of New York City.

Dr. Riggs, the next speaker, talked on "The Oswego Spirit" and the work of Dr. Sheldon, the founder of Oswego Normal. He pointed to four indices of the rapid growth of industrial education at Oswego Normal.

Dr. J. C. Park, of Oswego, the next speaker, called attention to the long record of the club and expressed the hope that it would endure for another thirty years.

Dr. Dearborn, of New York University, the next speaker, talked on the subject, "The Advancement of Education in a Large University," and showed how one man had helped to make it great.

Mr. E. D. Griswold, the next speaker, told of his Oswego Normal days and of the organization of the club. Other speakers were Mr. H. D. Woster, Mr. Hazen Chatfield, Mr. C. D. Hanford, Mr. Homer Bretch, Mr. H. J. MacDonald, and Mr. C. D. Murray.

Officers for the next year were elected as follows:

President, Mr. H. J. MacDonald; vice-president, Mr. Joseph Bonnaci; secretary, Mr. William Davis; assistant secretary, Mr. K. W. Hunter; treasurer, Mr. Lawson Harper; assistant treasurer, Mr. Glen Whitcomb.

ST. PAUL MANUAL-ARTS CLUB HOLDS MEETING

The St. Paul Manual-Arts Club held its regular meeting on March 21, at Carlings, St. Paul, Minn. Following a cafeteria dinner, the regular program was carried out. Dr. Homer J. Smith, of the University of Minnesota, spoke on the sub-

(Continued on Page 44a)

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is ideal for
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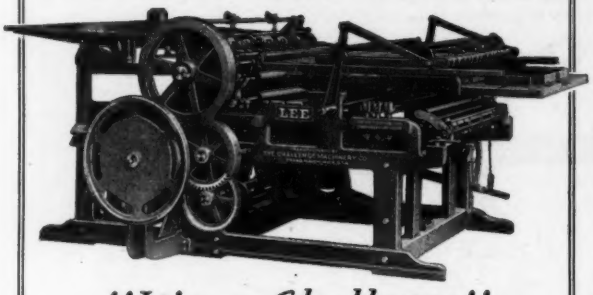

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(Continued from Page 43a)

ject, "Our Students and the World of Work"; Mr. G. M. Brace, of St. Paul, discussed "Plans for Vocational Guidance in the Junior High Schools."

THE COLUMBIA SCHOLASTIC PRESS ASSOCIATION MEETING

The Columbia Scholastic Press Association convention, which was held at Columbia University, March 13, 14, and 15, was attended by more than 1,500 student editors and faculty advisers, who came from Pasadena, San Antonio, Fort Wayne, Cincinnati, Columbus, Cleveland, and points east. Dr. Arthur Dean, of the National Arts Club, educational representative of the American Type Founders Company, spoke at the meeting.

Of the prize winners among the 700 scholastic news sheets and periodicals rated, newspapers and magazines from 48 states, Alaska and continental Europe, a number were the products of school printshops.

An exhibit of the prize-winning publications afforded excellent examples of the printers' art, particularly in the setting up of borders, advertisements, in the proper spacing of pages, and in the accuracy of the craftsmanship.

For the first time in the history of extracurricular activities, five gold keys were awarded for distinctive work in connection with the development of school publications. The prizes were given to the following:

Lambert Greenawalt, faculty adviser, York-High Weekly, Penn High School, York, Pa.; Clyde R. Miller, director of bureau of educational service, Teachers College, Columbia University; Charles F. Troxell, faculty adviser, Frankford Highway, Frankford High School, Philadelphia, Pa.; Miss Gertrude L. Turner, faculty adviser, Oracle, Abington High School, Abington, Pa.; Dewitt D. Wise, assistant editor, School Press Review, and faculty member of the junior high school, New Rochelle, N. Y.

These awards are made annually to school officials, faculty advisers, and others doing outstanding work in journalism.

The Student's History of Printing

By M. W. Haynes. Cloth, 132 pages. Price, $1.40. McGraw-Hill Book Company, New York City.

The author has told the story of the origin and development of the art of printing in simple chronological form, and has eliminated practically all pretensions at literary style, as well as explanations and interpretations. The method permits of the effective introduction of a vast number of significant facts and events within a limited space. It requires the teacher and the student to draw their own conclusions and to form their own opinions. The book is, however, far more than a dry succession of facts, for the author has cleverly introduced many events which indicate the interplay of military, civic, social, and other events which influenced the graphic art, or were affected by it. The part played by American inventors and industrialists in the past 60 years is very strongly, and properly, emphasized.

Vocational Mathematics

By Edgar M. Starr and Edwin G. Olds. Cloth, 184 pages, illustrated. Price, $1.25. Published by P. Blakiston's Son & Co., Inc., Philadelphia, Pa.

This vocational arithmetic covers a wide field and contains a great many problems. There may be some objection to it, however, because quite a bit of emphasis is placed on the traditional definitions.

(Continued on Page 46a)

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Vandercook Proof Presses

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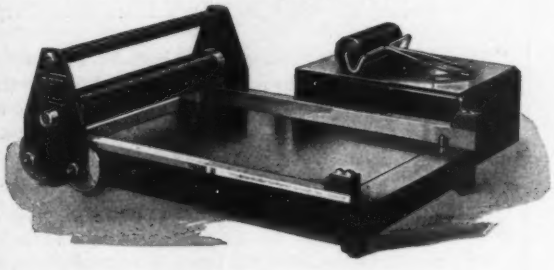

Especially designed for schools which cannot make a larger investment in a proof press or which desire to secure, at a low cost, a high grade printing device. This press embodies all the features of the larger Vandercook Presses. All parts are sturdy and accurately made and machined, giving a high degree of precision, accuracy and ease of operation. The polished steel top of the ink and roller box makes a very convenient ink plate. Cleaning rags and cleaning fluid can also be accommodated in this box. Two, three and four color work done with ease by means of the Register Device that comes with the machine.

The Vandercook No. 1

An efficient, reliable proof press for the school print shop. Unsurpassed in its class for accuracy and dependability. Discriminating school buyers everywhere specify Vandercook because they appreciate the great accuracy of which these presses are capable. The Vandercook No. 1 is an ideal machine for all hand-inking work within its size. It will handle easily all work in the average school print shop. Investigate this machine before ordering your new equipment. It will be worth your while.

No. 2 Proof Press

In the Vandercook No. 2 Proof Press, the school print shop has an ideal machine. It is an accurate, rigid bed press large enough to proof full length galleys of straight matter or a full-size newspaper page. Furnishes a valuable medium for instruction on makeready and other printing problems. Forms can actually be tested for faulty material or workmanship on this press. Cuts may be underlaid, bad letters changed, rules joined and, in fact, the methods of makeready can be largely taught without tying up the regular press. Handy box for supplies directly below bed. You will be amazed at the wide range of work which this proof press will handle.

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. . . and it comes through unbroken.

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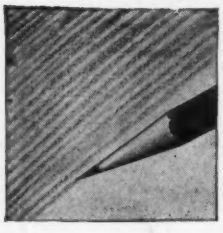

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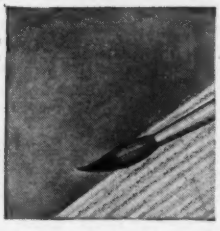

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And the extra service they render is appreciated by all who work with water colors. They may be used like ordinary pencils—the colors washed with a clean, wet brush—and the result is a surprisingly smooth, even wash, hard to distinguish from the finest water-color work.

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(Continued from Page 44a)

Chapters on formulas, logarithms, plane trigonometry of the right triangle, and curve plotting also are part of the book.

General Metal Work

By Alfred B. Grayshon. Cloth, 206 pages, illustrated. Price, $1.70. Published by D. Van Nostrand Company, Inc., New York, N. Y.

The author has attempted to embody in one book information about sheet-metal work, bench metal work, and machine-shop work. There are a number of projects with operation sheets to go with the explanations of the tools and equipment used by the metal worker and the machinist. Besides the sheet-metal work and the problems for the machinist, there are a few problems in wrought-iron work.

Fitting Farm Tools

By Louis M. Roehl. Paper, 102 pages, illustrated. Price, $1. Published by The Bruce Publishing Company, Milwaukee, Wis.

This instructive booklet will be found useful not only by agricultural students, but by farmers in general who have repairing to do on the equipment used in agricultural work. Full directions are given for installing and operating the simple equipment which is needed for grinding farm tools such as axes, knives, scythes, ensilage-cutter blades, sickles, and harrow disks. Directions also are given for making simple holding devices, into which the tools that are to be sharpened may be clamped.

The chapter on saw filing which includes not only hand and ripsaw filing, but also the sharpening of timber saws and circular saws is very complete, and the material on fitting farm tool handles and on forging, tempering, and reconditioning steel tools will be found very helpful.

The booklet, in spite of its small size, contains a great deal of very practical and helpful material.

Pictorial Drafting

By John H. Hills. Cloth, 158 pages, illustrated. Price, $1.50. Published by McGraw-Hill Book Company, New York, N. Y.

This interesting and instructive little book is divided into three parts: one on isometric drawing, one on oblique and cabinet drawing, and another on perspective drawing. The subject is handled in a very interesting way with sufficient examples worked out in detail to make it easy for the student to solve the original problems which are given.

Principles of Woodworking

By Herman Hjorth. Cloth, 307 pages, illustrated. Price, $1.76. Published by The Bruce Publishing Company, Milwaukee, Wis.

The author of this book has succeeded in producing a very complete treatise for the woodworker. Both the conventional hand tools as well as the up-to-date machine tools are fully illustrated and described and their uses explained. The projects, of which there are quite a number, are well illustrated and a suggested order of tool operations accompanies each one. Review questions accompany each chapter so that it is easy for the reader to test his knowledge of that which he has just read.

The author has put considerable emphasis on the related information about tools, materials, and machinery, thus combining in this one book all the material which the student or the home woodworker will need to stimulate him to become a good craftsman.

An Occupational Survey of San Antonio, Tex.

By George H. Fern, A. and M. College of Texas, College Station, Tex. Contains the results of an occupational survey and recommendations for a vocational education program, conducted under the direction of Mr. Fern, in cooperation with the state department of industrial education, Austin, Texas.